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FINAL

ENVIRONMENTAL IMPACT STATEMENT

ENVIRONMENTAL IMPACT REPORT

WASHINGTON MOUNTAIN BROOK WATERSHED

AUGUST, 1981

BERKSHIRE COUNTY
MASSACHUSETTS

USDA-SCS-EIS-WS-(ADM)-81-01-(F)-MA

WASHINGTON MOUNTAIN BROOK WATERSHED
Berkshire County, Massachusetts

FINAL ENVIRONMENTAL IMPACT STATEMENT
and
FINAL ENVIRONMENTAL IMPACT REPORT

Sherman L. Lewis, State Conservationist
Soil Conservation Service

- SPONSORING LOCAL ORGANIZATIONS -

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Massachusetts Department of
Environmental Management
Boston, Massachusetts 02202

Massachusetts Water Resources Commission (MWRC)
Boston, Massachusetts 02202

Town of Lee
Lee, Massachusetts 01238

AUGUST 1981

PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
451 West Street
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USDA ENVIRONMENTAL IMPACT STATEMENT
(MWRC ENVIRONMENTAL IMPACT REPORT)
Washington Mountain Brook Watershed Project
Berkshire County, Massachusetts

Prepared in Accordance with
Sec. 102(2)(C) of P.L. 91-190
and
(Chap. 30, Sec. 62, Massachusetts G.L.)

SUMMARY SHEET

I. Final

II. Soil Conservation Service

III. Administrative

IV. Description of Action:

A watershed project to be carried out in Berkshire County, Massachusetts by the sponsoring local organizations, with federal assistance under the provisions of Public Law-566, 83rd Congress, 68 Stat. 666, as amended. The purposes of the project are flood prevention, streambank stabilization and sediment control, recreation, and municipal water supply storage. The project will be carried out in accordance with a watershed plan and consists of conservation land treatment, three multiple-purpose reservoirs and channel work. The channel work consists of approximately 50 feet of concrete channel; removal of sediment and debris; installation of bridge wingwalls; and construction of concrete sediment control facilities with a combined capacity of 7,600 cubic yards.

V. Summary of Environmental Impacts:

Average annual floodwater damages to existing property, including roads, bridges and 22 residences will be reduced by 93 percent or $82,780. Annual deposition of sediment on the alluvial fan will be reduced by about 57 percent or 2,300 cubic yards. Surface storage of municipal water will be provided for the towns of Lee and Lenox. This represents an increase of 2.45 million gallons per day in the safe yield of the local water wupply. A total of 298 acres of open water and 55 acres of wetlands will be created, of which 314 acres will provide 18,840 fishing activity days annually for public use. A total of about 391 acres of land will be required to complete the project. The effect on existing resources include: loss of 129 acres of forest land and associated wildlife habitat; loss of 65 acres acres of wetland and associated wildlife habitat; loss of 5,400 feet of perennial stream and 1,500 feet of intermittent stream; alteration of about 600 feet of a previously modified perennial stream; occasional temporary inundation of 300 feet of intermittent stream; and 300 feet of

perennial stream and associated habitat; impaired value of wildlife habitat on 41 acres of forest land. There will be an increase in noise, air and water pollution during the project life. Temporary effects during construction activity include an increase in noise, air pollution, erosion and sedimentation.

VI. Alternatives:

Alternative plans have been considered with particular attention to those actions that might avoid some or all of the adverse environmental effects of completing the planned project, and reasonable alternatives that have been suggested by others. These alternatives are:

Single-Purpose Flood Prevention Structures (3), Ground Water Development, Channel Work

Single-Purpose Flood Prevention Structures (2), Multiple-Purpose Flood Prevention and Recreation Structure (1), Ground Water Development, Channel Work

Single-Purpose Flood Prevention Structure (1), Multiple-Purpose Flood Prevention and Recreation Structure (1), Multiple-Purpose Flood Prevention and Water Supply Structure (1), Channel Work

Single-Purpose Flood Prevention Structure (1), Extensive Channel Work, Ground Water Development

Single-Purpose Flood Prevention Structure (1), Nonstructural, Ground Water Development

Multiple-Purpose Flood Prevention and Recreation Structures (2), Multiple-Purpose Flood Prevention, Water Supply and Recreation Structure (1), Channel Work

No Project

VII. Agencies and organizations from which written comments have been requested:

Department of the Army
Department of Commerce
Department of Health, and Human Services
Department of the Interior
Department of Transportation
Environmental Protection Agency
Federal Energy Regulatory Commission

Office of Equal Opportunity
Massachusetts Water Resources Commission
(Designated State Agency)
Executive Office of Communities and Development
(State Clearinghouse)
Berkshire County Regional Planning Commission
(Regional Clearinghouse)
Massachusetts Historical Commission
Berkshire Natural Resources Council
Massachusetts Audubon Society
Massachusetts Executive Office of Environmental Affairs
Conservation Law Foundation
Appalachian Mountain Club

VIII. Draft Statement transmitted to the Environmental Protection Agency September 9, 1980.

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WASHINGTON MOUNTAIN BROOK WATERSHED

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USDA, SOIL CONSERVATION SERVICE
FINAL ENVIRONMENTAL IMPACT STATEMENT
MWRC, DIVISION OF WATER RESOURCES
FINAL ENVIRONMENTAL IMPACT REPORT
for
Washington Mountain Brook Watershed
Berkshire County, Massachusetts

AUTHORITY

Installation of the project constitutes an administrative action. Federal assistance will be provided under authority of Public Law-83-566, 83rd Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Berkshire Conservation District
Town of Lee
Massachusetts Department of Environmental Management
(formerly Natural Resources)
Massachusetts Water Resources Commission

PROJECT PURPOSES AND GOALS

1. To provide protection to residences, roads and bridges in the flood plain of the Washington Mountain Brook from floodwaters resulting from a 100-year storm;

2. To stabilize the stream channel and banks, and control sediment deposition;

3. To provide water impoundments for recreational use to enhance the recreational potential of the October Mountain State Forest; and

4. To provide municipal water storage for the town of Lee (with the capability of supplying the adjacent town of Lenox).

SUMMARY OF THE PLAN FORMULATION PROCESS

Washington Mountain Brook Watershed project was planned under the authority of Public Law 83-566, the Watershed Protection and Flood Prevention Act administered by the United States Department of Agriculture's Soil Conservation Service.

Enacted by Congress in 1954, P.L. 566 was designed to prevent erosion, floodwater, and sediment damages; to further the conservation, development, utilization and disposal of water; and the conservation and utilization of land.

Since 1954, many communities, with the assistance of P.L. 566, have demonstrated that they can halt soil erosion and excessive water runoff, reduce destructive floods, improve drainage conditions on agricultural land, provide for more efficient irrigation, supply water for growing municipal needs, attract new industries, enhance fish and wildlife resources and provide developments for recreation.

These small watershed projects are based on (1) local initiative and responsibility, (2) federal technical, financial cost-sharing, and credit assistance, and (3) state review and approval of local proposals and the opportunity for state financial and other assistance.

The Washington Mountain Brook Watershed project was approved by Congress in 1968; and federal assistance was authorized by the Administrator of SCS in April 1969.

The original watershed plan, which outlined the project components was developed between 1963 and 1968. Formulation of the plan was more difficult and time consuming than normal owing to the unique features of the project. These features included:

1. The nature of the flooding problem in the town of Lee. The flooding is occuring on a dynamic alluvial fan and the damages were caused by floodwater together with large debris loads (boulders).

2. Approximately 90 percent of the watershed was public land, owned and administered by the Massachusetts Division of Forests and Parks.

3. The watershed was also a public water supply for the town of Lee, which controlled the water rights. Development of this drainage area for water supply was authorized in 1897 by the General Court of Massachusetts via Chapter 234.

4. The objective of including recreation storage in the flood control reservoirs in a water supply watershed.

In formulating alternative plans to alleviate the flooding and reduce damages, the destructive nature of the flooding and hazard involved imposed constraints on the type of measures that would be both technically and cost effective. An effective solution required controlling the movement of debris (boulders and smaller sediments) as well as the volume of floodwater. Simple dikes or levees,

realignment of bridge abutments, or increased capacity of bridges would not afford any control on the movement of debris or prevent the ultimate danger, the formation of debris dams. While relocation of the residences considered to be susceptible to major damage would reduce some of the existing damage and hazard, these residential damages represented only a small portion of the total flood damages. Floodproofing could be utilized to prevent water damage, but these measures would not withstand the powerful impact of the waterborne debris, tumbling boulders and excessive velocities. Ultimately, the only technically effective means of flood control consisted of (1) building upstream reservoirs to reduce the volume of water and debris, together with a sediment and debris basin to trap the remaining debris, or (2) building a larger debris basin coupled with a concrete channel that would convey the floodwaters through the entire flood damage reach to the Housatonic River.

The objective of providing expanded fishing opportunities in a watershed approved for water supply development (and currently utilized by the town of Lee) resulted in a compromise trade-off between the Commonwealth and the town of Lee. In exchange for the right to develop recreation reservoirs in the watershed, the Commonwealth would provide water supply storage of 200 million gallons in one of the reservoirs for the town of Lee. The compromise was acceptable because Lee currently extracts water from the watershed at a point downstream of the planned recreation reservoirs; but with the storage provided upstream, Lee could convey the water to their primary reservoir via a pipeline and abandon this instream intake. This arrangement prevailed until 1977, when it was suggested that the project be expanded to provide municipal water supply for the town of Lenox as well as the town of Lee. In assessing this proposal, both communities in 1978 updated their analysis of water supply needs for both the present and the near future. The reformulated plan, which now included water supply storage in two reservoirs (one together with recreation storage) and one recreation reservoir, all with complementing flood control storage was preferred by the project sponsors to all other suggested plans.

However, the new watershed plan, outlined in Supplemental Watershed Plan No. 4, effective July 16, 1980 (see Appendix A), required several more compromises and agreements. Foremost of these compromises involves Article 97 of the State Constitution which concerns dedicated state parkland. Some people feel that the water supply reservoirs are a diversion of public land covered by this Article, while others regard it as a previously granted right under the Acts of 1897.

The second area of disagreement centered on the utilization of the water supply storage. The impoundments had been proportioned to accommodate the projected needs of Lee and Lenox through the year 2020. However, Lee held the water rights and the right to develop the watershed for water supply. In turn, Lenox was considering other (although not necessarily more advantageous) options in lieu of actively pursuing the Washington Mountain Brook project. Lenox has now opted for the Washington Mountain Brook project and signed an agreement with the town of Lee on November 26, 1980 (see Appendix A). In essence, the two towns have agreed to cooperate in developing a permanent regional water supply based on the present watershed plan.

PLANNED PROJECT (Selected Plan)

The Washington Mountain Brook Watershed is in Berkshire County, Massachusetts (New England Region, 01100005) and is situated in the towns of Lee, Becket and Washington (Figure 1). The watershed is included on the USGS East Lee quadrangle. The watershed has a total drainage area of 5,740 acres, of which 5,150 acres are in the October Mountain State Forest. Washington Mountain Brook is a tributary of the Housatonic River. Principal uses of the watershed are recreation, timber production and water supply. Lenoxdale, a small village, is located at the outlet of the watershed. The watershed is located approximately 105 miles west of Boston and 45 miles northwest of Hartford, Connecticut.

Principal water resources problems in the watershed and vicinity are: flood damages to residential buildings, roads and bridges; sediment damages; lack of adequate recreational facilities; and lack of adequate municipal water supply for the towns of Lee and Lenox.

The Washington Mountain Brook Watershed Project is described in a watershed plan authorized in 1969 and supplemented in 1969, 1971, 1973 and 1980. The project provides for watershed protection, flood prevention, municipal water supply, and recreation. The watershed plan, as supplemented, includes conservation land treatment, one flood control and recreation structure, one flood control, water supply and recreation structure, one flood control and water supply structure, and channel work.

The flood control and recreation structure (Washington Mountain Lake, dam and dike) was installed in 1973. However, this dam is functioning only as a flood control structure, due to remaining land rights considerations (utility relocation). There is presently no permanent pool behind the structure.

This report deals only with the remaining works of improvement planned for installation within the scope of the watershed plan, as supplemented.

Land Treatment

Land treatment measures are limited to forested areas in the October Mountain State Forest, and will be installed by the Massachusetts Division of Forests and Parks through ongoing programs. No land treatment measures are proposed for private land.

Application of land treatment measures is designed to reduce runoff and erosion, and to increase infiltration of water into the soils. These measures will contribute to the flood control benefits by supplementing the structural measures. The land treatment measures are hydrologic-cultural operations, and skid trail and logging road erosion control.

Hydrologic-cultural operations are designed to improve hydrologic conditions by manipulation of forest stand composition to create favorable conditions for maximum production and protection of litter, humus and forest cover.

These operations will be carried out on approximately 600 acres of the watershed.

Skid trail and logging road erosion control measures divert water from skid trails and logging roads to reduce the volume of rapid runoff and control soil erosion. Water bars (ditches with poles or earthen diversions) are the usual measures used to reduce the velocity and divert runoff which causes erosion. Some eroding areas will be vegetated to hold the soil in place. Erosion control measures will be carried out on 2 miles of skid trails and logging roads.

Structural Measures

Structural works of improvement consist of one flood control and water supply structure (Schoolhouse Lake); one flood control, recreation and water supply structure (October Mountain Lake); completion of the Washington Mountain Lake site to serve as a flood control and recreation structure; and channel work. The location of these measures is shown on Figure 1.

Multiple-Purpose Structures (Dams)

Permanent impoundments will be created at three locations within the watershed. This will require two additional dams constructed of compacted earth, each with a principal spillway and an emergency spillway. The principal spillways will consist of a reinforced concrete riser and conduit to control the elevation of the permanent pools. The emergency spillways will be cut into an earth abutment at one end of the dam and then vegetated. The surface of the embankments will be protected from erosion by rock riprap or vegetation.

The three impoundments will have a total storage capacity of 6,622 acre-feet, of which 1,612 acre-feet is planned for flood control, 3,713 acre-feet for recreation, 1,234 acre-feet for municipal water supply and 63 acre-feet for sediment accumulation. (The total storage capacity of the Washington Mountain Lake site is 3,910 acre-feet, of which 3,896 acre-feet is presently available for flood control.) The two remaining structures planned for installation will control runoff from 4.55 square miles of drainage area (about 51 percent of total watershed) increasing the controlled portion of the watershed to about 65 percent.

The flood control storage capacity of the impoundments will control the 10-day, 100-year frequency volume of runoff from the area draining into each site. The sediment storage allowance is based on the estimated accumulation during a 100-year period. The permanent water storage varies from site to site to make the best use of individual sites for flood control, recreation and water supply. Selected characteristics of the impoundments are summarized in Table 1.

The Washington Mountain Lake (Figure 2) structure was installed in 1973. The structure was designed as a flood control and recreation structure and has a total storage capacity of 3,910 acre-feet which is presently used only for flood control and sediment accumulation. The capacity of 3,910 acre-feet

LEGEND

- Watershed Boundary
- Town Boundary
- Streams
- Railroad
- Power—Transmission Line
- Construction Access Road
- Forest Boundary
- Roads
- Structure Drainage Area
- Primary Area Benefited
- 3 Damage Reach
- Channel Work
- Multi—Purpose Structure
- Proposed Pipeline Route

LOCATION MAP

MASS.

WOODLAND STREET 2.5 Miles

UNDERGROUND TELEPHONE CABLE

DRAINAGE AREA = 832 ACRES

LENOX-WHITNEY BRANCH RD.

PITTSFIELD ROAD 1.6 Miles

WEST PLACE

DRAINAGE AREA = 820 ACRES

WASHINGTON MOUNTAIN LAKE SITE

OCTOBER MOUNTAIN LAKE SITE

COUNTY ROAD

TRIANGLE BORROW AREA

SCHOOLHOUSE LAKE SITE

ROAD

WASHINGTON MOUNTAIN ROAD

BROOK

MASS. ROUTE 8 3.0 Miles

DRAINAGE AREA = 2,093 ACRES

WASHINGTON

BECKET WASHINGTON

BECKET

WASHINGTON

WASHINGTON

UPPER RESERVOIR

LEE

WOODLAND STREET

MILL ST.

FINERTY POND

1

2

3

SCALE IN FEET

2000 0 2000

FIGURE 1

PROJECT MAP

WASHINGTON MOUNTAIN BROOK WATERSHED

BERKSHIRE COUNTY, MASSACHUSETTS

1-12666

USDA-SCS LANHAM, MD 1979

TABLE 1

SELECTED MULTIPLE-PURPOSE STRUCTURE DATA
WASHINGTON MOUNTAIN BROOK WATERSHED

	Unit	October Mountain Lake	Schoolhouse Lake	Washington[1/] Mountain Lake	Totals[2/] Remaining Work
Drainage Area	Acres	820	2,093	(832)	2,913
Elevation					
Top of Dam	Ft. (msl)	1,775	1,713	(1,804)	--
Design High Water	Ft. (msl)	1,772.7	1,710	(1,800.7)	--
Permanent Pool	Ft. (msl)	1,768	1,694	1,798[3/]	--
Volume of Fill	Cu. Yds.	114,300	155,000	(70,000)	269,300
Height of Dam	Ft.	36	63	(36)	
Capacity					
Total	Ac. Ft.	1,408	1,304	(3,910)	2,712
Sediment Accumulation	Ac. Ft.	14	35	(14)	49
Recreation	Ac. Ft.	502	0	3,211[3/]	3,713
Water Supply	Ac. Ft.	614	620	0	1,234
Flood Control	Ac. Ft.	278	649	685[4/]	1,612
Surface Area					
Beneficial Use Pool	Acres	90	39	224[3/]	353
Flood Control	Acres	96	55	243	394
Depth of Permanent Pool					
Mean	Ft.	12.4	15.9	14.3	--
Maximum	Ft.	28.0	37.5	23	--

1/ Dam construction completed November 12, 1973. Parenthesis indicate "as built." Clearing of site completed November 24, 1976.

2/ Includes only remaining work or considerations required to realize completed planned project.

3/ Pending settlement of land rights (utility relocation).

4/ Flood control volume is determined by the elevation of emergency spillway crest. A minimum of 3 feet between the recreational pool and emergency spillway crest was allowed due to 3 foot wave considerations.

was proportioned in design as follows: flood control, 685 acre-feet; recreation, 3,211 acre-feet; and sediment accumulation, 14 acre-feet. The design surface area of the recreation pool is 224 acres and the flood pool is 243 acres. The recreation pool will have an average depth of 14.3 feet and a maximum depth of approximately 23 feet. Approximately 144 acres of the lake will have a depth exceeding 15 feet. The riser incorporated within the dam has an automatic release for bottom water. Flows of approximately 1.3 cfs (1 csm) or less will originate from near the bottom of the lake where the water is cooler. Flows in excess of 1.3 cfs will be a mixture of bottom and surface water. An additional release feature will allow up to 1.0 cfs discharge originating at a depth of 1 to 2 feet. This will provide a discharge even through prolonged periods of drought. (Ninety days discharge would lower the recreation pool by 0.8 feet.)

Filling of Washington Mountain Lake requires the relocation of 3,100 feet of underground telephone cable owned by the American Telephone and Telegraph Co. (AT&T). The cable traverses the planned recreational lake area (see Figure 2). Initially, the cable was to be inundated at its present location. However, following completion of the dam, AT&T realized that a cable splice located beneath the lake could pose a maintenance problem. It is now proposed to relocate the cable in such a way that no cable splices will be within the lake area.

The Massachusetts Division of Fisheries and Wildlife will stock and manage the lake as a combination cold and warm-water fishery. The reservoir will support a self-sustaining warm-water fishery.

October Mountain Lake (Figure 3) will have a total storage capacity of 1,408 acre-feet, with 502 acre-feet for recreation, 14 acre-feet for sediment accumulation, 614 acre-feet for municipal water supply, and 278 acre-feet for flood control. The combined surface area of the recreation pool and the water supply pool will be 90 acres. The flood pool surface area will be 96 acres. The maximum depth of the lake will be 28 feet with 50 acres at least 15 feet in depth.

Two separate embankments will be constructed at October Mountain Lake. The principal dam will have a maximum height of 36 feet and will contain 114,300 cubic yards of fill. A principal spillway, pool drain with gate, an emergency spillway, and gated water supply intake pipe will be provided at the principal dam. An automatic continuous release feature will be incorporated into the principal spillway . This feature will provide a continuous release of 0.30 cfs (.23 csm). This flow will originate at a depth of about 8 feet, which provides for flows other than the warmer surface waters, especially during periods of drought. A mixed release of mid-depth and surface water will occur when the reservoir is full, with water flowing over the principal spillway riser crest.

An upstream dike is necessary to provide the required storage volume at October Mountain Lake. This dike is located downstream from the natural drainage area divide to exclude a 42-acre organic soil - wetland area from the permanent pool. This was desirable to avoid a potential reduction of water quality in the water supply pool, and to minimize the acreage of

Figure 2

PRELIMINARY PLAN

WASHINGTON MOUNTAIN LAKE

WASHINGTON MOUNTAIN BROOK WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

1,R-10,869 JULY 1977

USDA-SCS HYATTSVILLE MD 1978

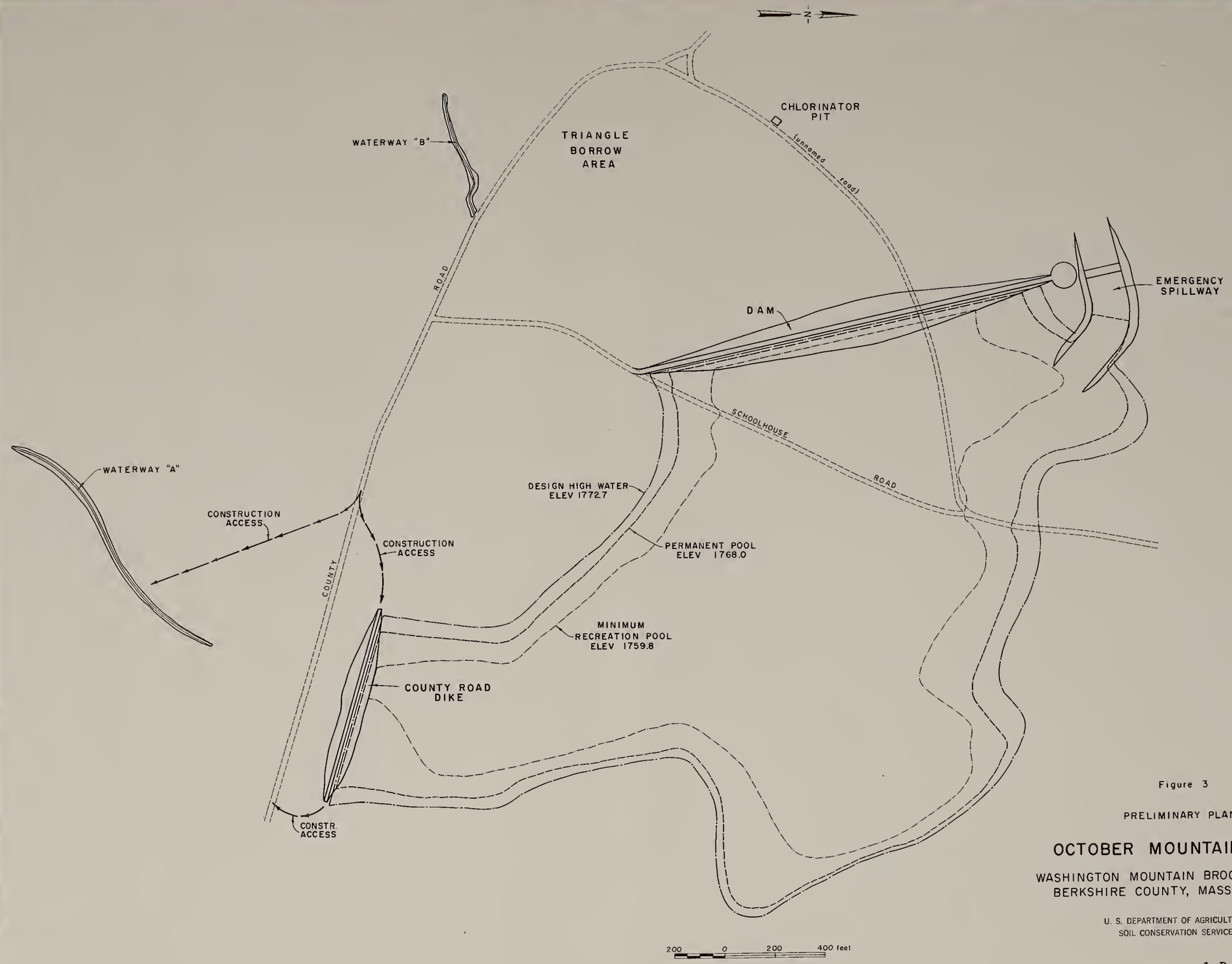


Figure 3

PRELIMINARY PLAN

OCTOBER MOUNTAIN LAKE

WASHINGTON MOUNTAIN BROOK WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

1,R-10,869

JULY 1977

USDA-SCS LANHAM, MD 1979

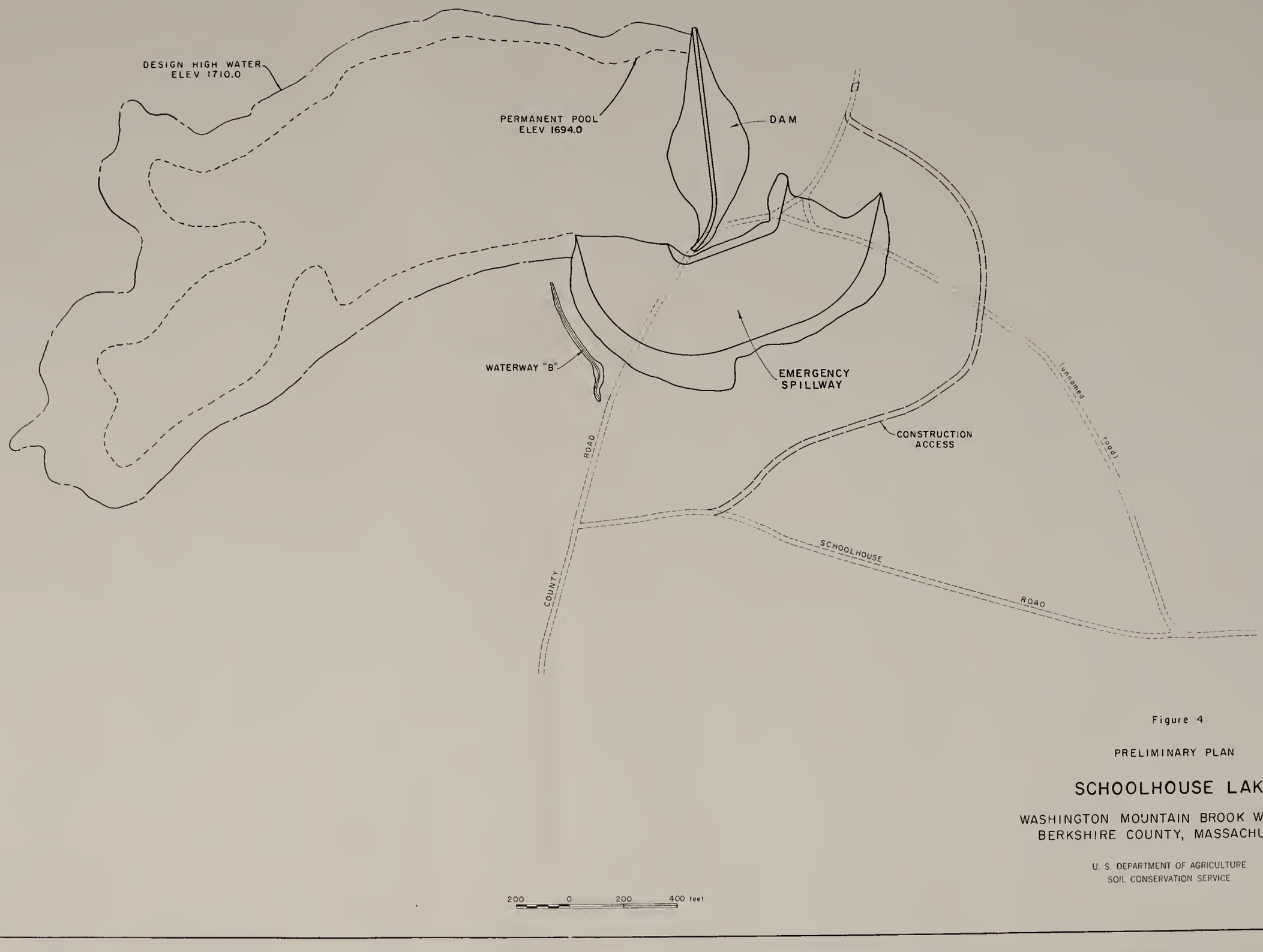


Figure 4

PRELIMINARY PLAN

SCHOOLHOUSE LAKE

WASHINGTON MOUNTAIN BROOK WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

JULY 1977

USDA-SCS LANHAM, MD 1979

wetlands affected at this site. A waterway (Waterway "A", Figure 3) will be installed upstream of the dike to prevent excessive backwater flooding and maintain the Types 2, 3, 6, and 7 wetlands occurring above the dike. The area disturbed by installation of this waterway will be vegetated with a suitable grass. About 2 acres of existing softwood woodland will be cleared to accommodate the channel, channel excavation and disposal of cleared material.

The permanent pool area will be cleared of trees and brush. Where the depth of the pool is 3 feet or less, all trees and brush will be cut flush with the ground. In the deeper water, a 12-inch (maximum height) stump will be left. All material will be disposed of in a manner acceptable to the Division of Air Pollution Control of the Massachusetts Department of Environmental Quality Engineering.

Recreational use of October Mountain Lake will be provided by a self-sustaining warm-water fishery and stocking of cold-water species. The Massachusetts Division of Fisheries and Wildlife will be responsible for fishery management.

The volume of municipal water storage in October Mountain Lake needed to replenish Lee's Codding Brook Upper Reservoir will be withdrawn during the months of December through March until such time as local demand warrants a change in management to allow year-round use of the water supply storage. This withdrawal will not cause the water level in October Mountain Lake to fall below the designed level of the recreation storage pool. Withdrawal of 614 acre-feet of water is equivalent to 0.5 million gallons per day mgd per year. Continuous daily withdrawal from the 614 acre-feet storage represents a safe yield of 0.88 mgd. When withdrawal is only during the December-March period, the municipal water supply pool will usually be replenished by surface runoff during April and May. Therefore, the maximum beneficial pool would normally be available for fishing purposes during the summer. Therefore, the water supply intake will be set at the base of the water supply storage pool and above the recreation storage pool.

The Massachusetts Water Resources Commission will provide a chlorinator, gated water intake and facility shelter at October Mountain Lake. The town of Lee will install additional facilities to transmit water to Codding Brook Upper Reservoir and treatment facilities and will abandon the present water supply intake near the outlet of the watershed.

Schoolhouse Lake (Figure 4) will have a total storage capacity of 1,304 acre-feet, with 620 acre-feet for municipal water supply, 35 acre-feet for sediment accumulation, and 649 acre-feet for floodwater retention. The surface area of the water supply pool will be 39 acres and the flood pool will be 55 acres. The water supply pool will be cleared of trees and brush in a manner similar to October Mountain Lake. The maximum depth of the water supply pool will be 37.5 feet. The dam will have a maximum height of 63 feet and will contain 155,000 cubic yards of fill. The principal spillway will be designed to provide a release of 0.2 cfs from the colder bottom level of the lake. The 614 acre-feet of storage will provide a safe yield of 1.57 mgd for municipal water supply. A gated intake will also be installed, as well as a connection to the pipeline leading from October Mountain Lake.

TYPICAL MULTIPLE-PURPOSE STRUCTURE

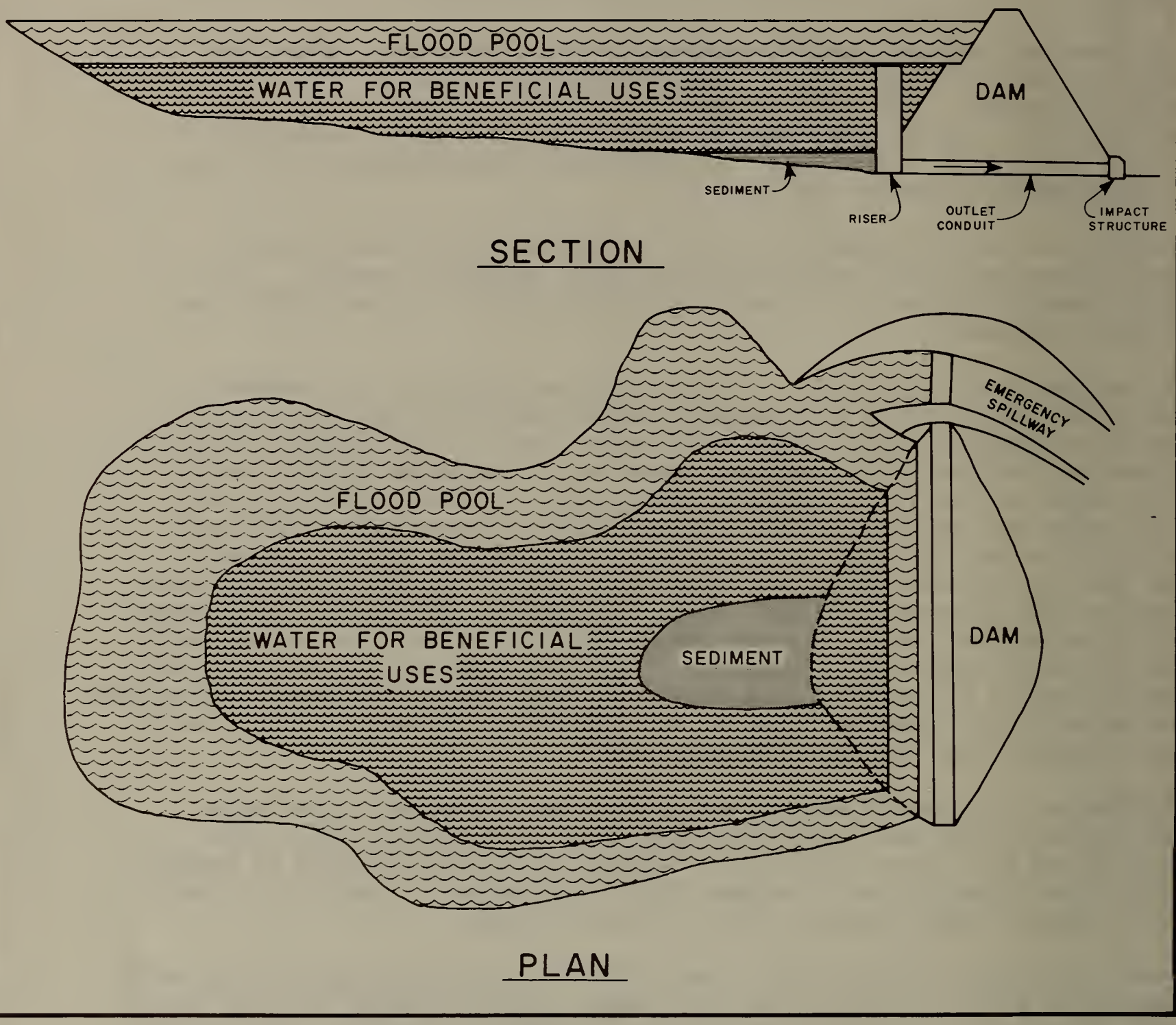


FIGURE 5

CROSS-SECTION AND PLAN VIEWS OF MULTIPLE PURPOSE STRUCTURE.

The watershed areas and reservoirs of October Mountain and Schoolhouse Lakes, which are totally within the October Mountain State Forest, will be managed according to appropriate health regulations for surface water supplies.

Dam Designs and Safety

Final designs of the October Mountain and Schoolhouse Lake sites will conform with Soil Conservation Service engineering criteria. Both sites are classified as Class C dams, which are "dams located where failure may cause loss of life, serious damage to homes, industrial and commercial buildings, important public utilities, main highways, or railroads." Consequently, the strictest set of criteria applies in designing these dams.

Design considerations for the dams include, but are not limited to the following:

1. Relatively minor (Zone 1) seismic hazard;
2. Height of dams established by runoff from 22.7 inches of rainfall over a 6-hour period;
3. Embankment slopes having factors of safety of two or greater;
4. Upstream embankment slopes protected by riprap to prevent wave erosion;
5. Crest of emergency spillways set above expected wave heights on permanent or normal pools;
6. All unstable soils removed from foundation areas;
7. Cutoffs to prevent direct access of pool water to permeable zones;
8. Inclined chimney drains installed to handle seepage, and to prevent piping.

The geology of both sites is very similar. The bedrock is hard, granitic gneiss. Locally (pockets), the rock is soft and partially weathered and has broken zones with relatively high permeability. However, the bedrock is overlain by very dense glacial till with relatively low permeability. The till forms a fairly uniform, impervious blanket over the bedrock in both the pool and foundation areas of both dam sites. The foundations of the dams will be keyed into sound, unweathered till.

The dam foundations were investigated by drilling, testpitting, and subjecting samples to numerous soil tests. The location and number of testholes and samples varied according to geologic conditions discovered at each site, and to insure that enough information would be available to design the dams. The SCS Soil Mechanics Laboratory performed tests on soil samples, and provided appropriate recommendations for design of the dams.

Seismic hazards were evaluated by a review of published data and by an examination of the watershed and dam sites for evidence of faulting. The records indicated a very low level of earthquake activity in western Massachusetts, and no damaging earthquakes with epicenters lying within the watershed have been reported. An ancient fault might exist in the bedrock near the downstream end of the watershed. However, no earthquakes have been associated with this fault, and there is no evidence of any recent ground rupturing caused by faulting in this area. In fact, the existence of even an ancient fault is not a well established fact, and is subject to interpretation. No recent, active faults were discovered in the watershed.

The Commonwealth of Massachusetts will be the owner of all the multiple-purpose structures, and will be responsible for their maintenance and the integrity of the dams. The Massachusetts Water Resources Commission (Division of Water Resources) will be responsible for the operation and maintenance of the impoundment structures (see Operation and Maintenance section, page 20). The Massachusetts Department of Environmental Quality Engineering (DEQE) is responsible for reviewing the designs and specifications of the structures. Approval of the design and specifications for a structure must be obtained from DEQE before an Invitation to Bid for construction can be issued.

Channel Work

Study of the unstable streambanks in Reach 3 resulted in the determination that an onsite solution for stabilization cannot be economically formulated. Therefore, the partial stabilization of these areas will be addressed through reducing peak flood flows by completion of the upstream structural measures. Sediment and debris control facilities will be installed in the lower portion of Reach 3 to reduce the movement of materials into Reaches 1 and 2, thereby maintaining the capacity of the stream channel and bridges.

The channel work will consist of:

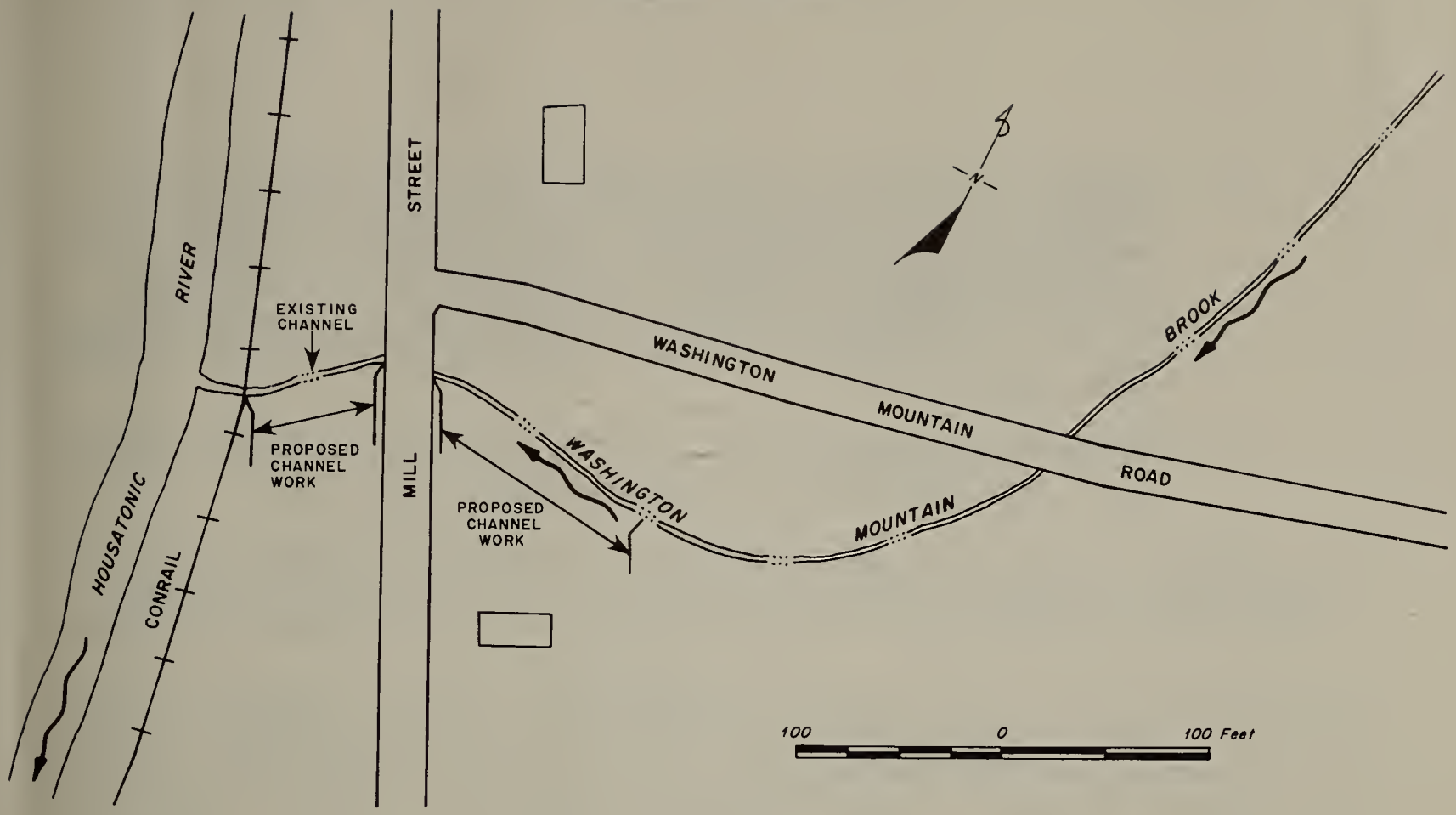
1. Removal of sediment and debris from the bridge openings of all bridges in Reaches 1 and 2 as necessary, (Conrail Railroad, Mill Street, Washington Mountain Road, Woodland Street and Newton Bridge).

2. Construction of a concrete channel between the Conrail Railroad and Mill Street bridges, including concrete paving of the bridge floors (Figure 6).

3. Installation of riprap wingwalls at the entrance to the Mill Street bridge.

4. Clearing and shaping the channel immediately upstream of Mill Street for a distance of about 100 feet.

PLAN VIEW



PROFILE

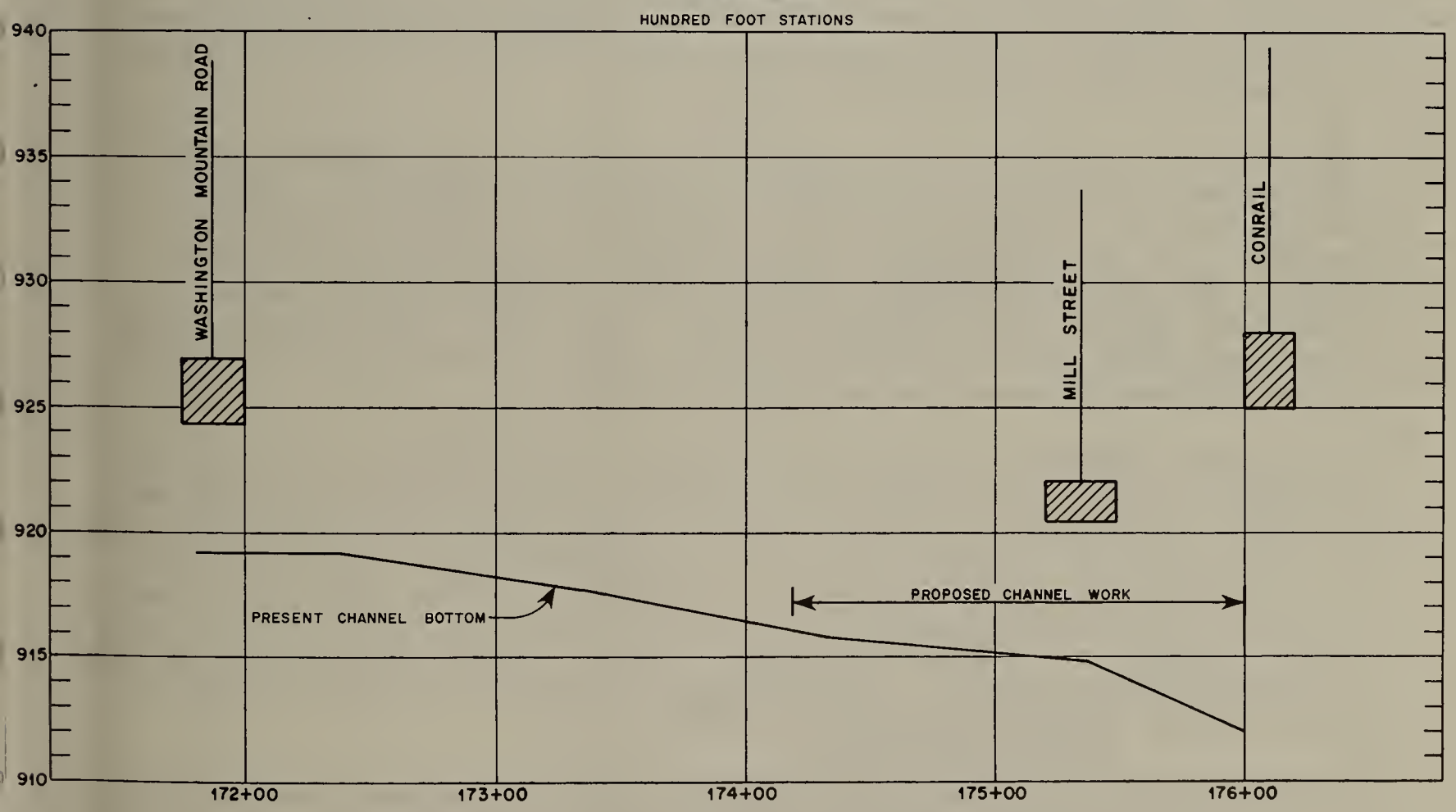


FIGURE 6

WASHINGTON MOUNTAIN BROOK

PRELIMINARY PLAN

REACH 1 CHANNEL WORK

5. Removal of sediment and debris from the stream channel within Reaches 1 and 2 at locations where the 100-year flood is to be confined to the stream channel. The appropriate locations and required volumes of sediment to be removed will be determined by onsite inspections following installation of upstream structures. This volume is currently estimated to be between 100-300 cubic yards.

6. Construction of sediment control facilities above Newton Bridge with a combined capacity of approximately 7,600 cy.

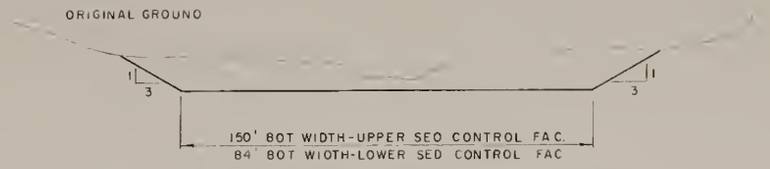
The design of the channel and modifications to bridge openings is to be based on the capacity to safely pass the peak flood flow of the 100-year flood with the completion of the upstream floodwater retarding structures.

The channel work at Mill Street (Figure 6) will consist of removal of sediment and debris to design grade and installation of approximately 50 feet of reinforced concrete channel between the Conrail Railroad bridge and the Mill Street bridge. This vertical-walled channel will vary from 28-20 feet in width, the respective widths of the Mill Street and railroad bridges. In addition the bridge floors (streambed) will be paved with concrete. New riprap wingwalls will be installed at the entrance to the Mill Street bridge, and the channel will be cleared and shaped for a distance of about 100 feet upstream. The combined effect of this channel work is to improve the hydraulic characteristics of the two bridges thereby reducing head losses and flood stages. In this channel work area, Washington Mountain Brook is a perennial, previously modified stream.

Channel work in Reach 3 will consist of installation of sediment control facilities in the lower portion above Newton Bridge (Figure 7). These facilities will be designed to trap approximately 7,600 cubic yards of sediment (all material greater than 6 inches in size) during a 100-year flood. The threshold velocity through these facilities will be about 6 feet per second. The remaining sediment volume will pass through to the Housatonic River with minimal deposition. Annual accumulation in the facilities will average an estimated 1,800 cubic yards.

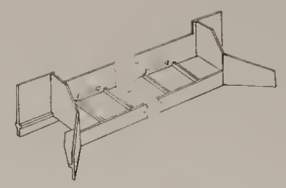
The sediment control facilities will consist of two systems with capacities of 6,000 and 1,600 cubic yards. The control structures will be reinforced concrete, approximately 116 feet wide and projecting 5 feet above the streambed. The overall structure height will be about 8 feet. The upper system will employ two of these structures spaced about 177 feet apart. The lower system (1,200 feet downstream from the upper system and about 925 feet above Newton Bridge) will employ one structure with a concrete apron about 175 feet upstream of the structure. The apron is to identify the level or depth to which removal of debris should be confined.

The total volume of concrete for the three control structures and the apron is estimated at 600 cubic yards. The structures are designed to safely pass flows during the 100-year flood, with completion of the upstream floodwater retarding structures.

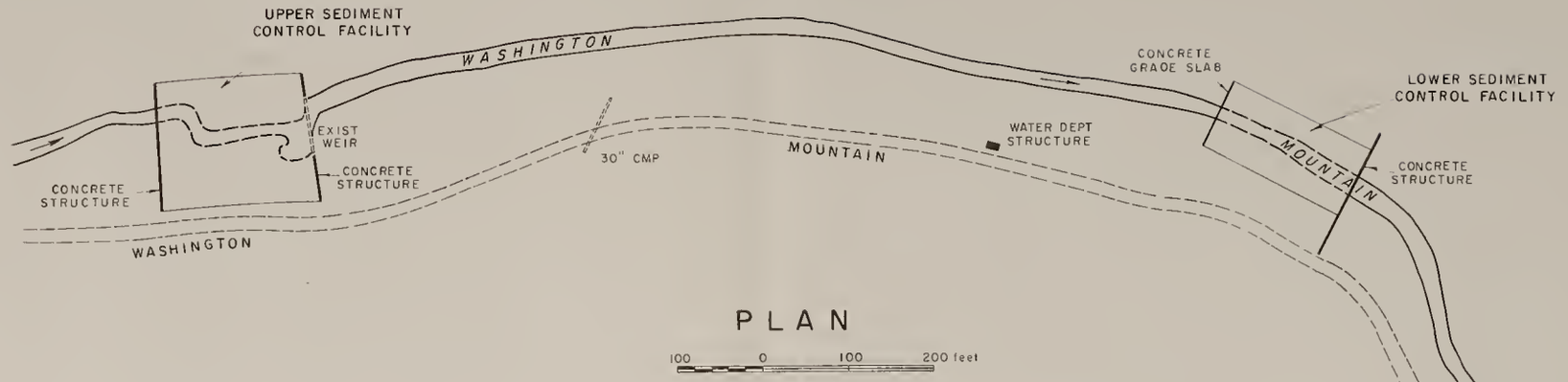


TYPICAL SECTION STILLING BASIN

NOT TO SCALE

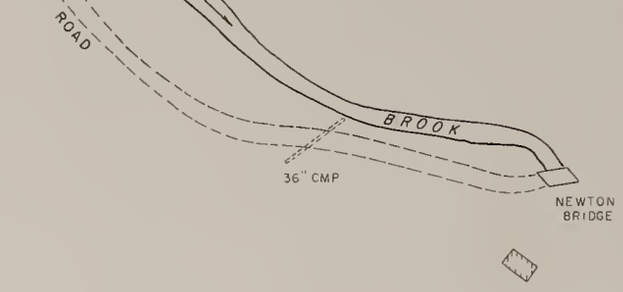


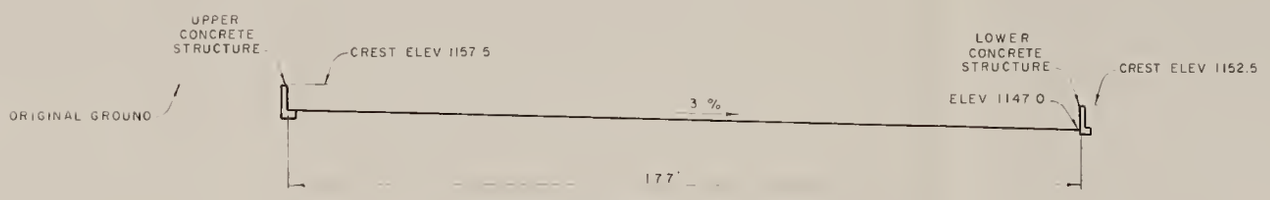
STRUCTURE PERSPECTIVE VIEW



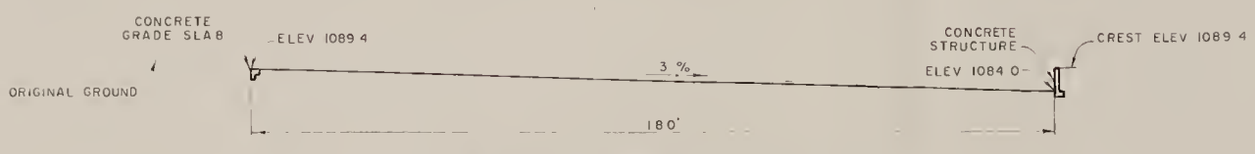
PLAN

100 0 100 200 feet





UPPER SEDIMENT CONTROL FACILITY
PROFILE



LOWER SEDIMENT CONTROL FACILITY
PROFILE

20 0 20 40 feet
(VERTICAL & HORIZONTAL)

Figure 7

PRELIMINARY PLAN

WASHINGTON MOUNTAIN BROOK CHANNEL WORK

WASHINGTON MOUNTAIN BROOK WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

JULY 1977

USDA-SCS LANHAM, MD 1979

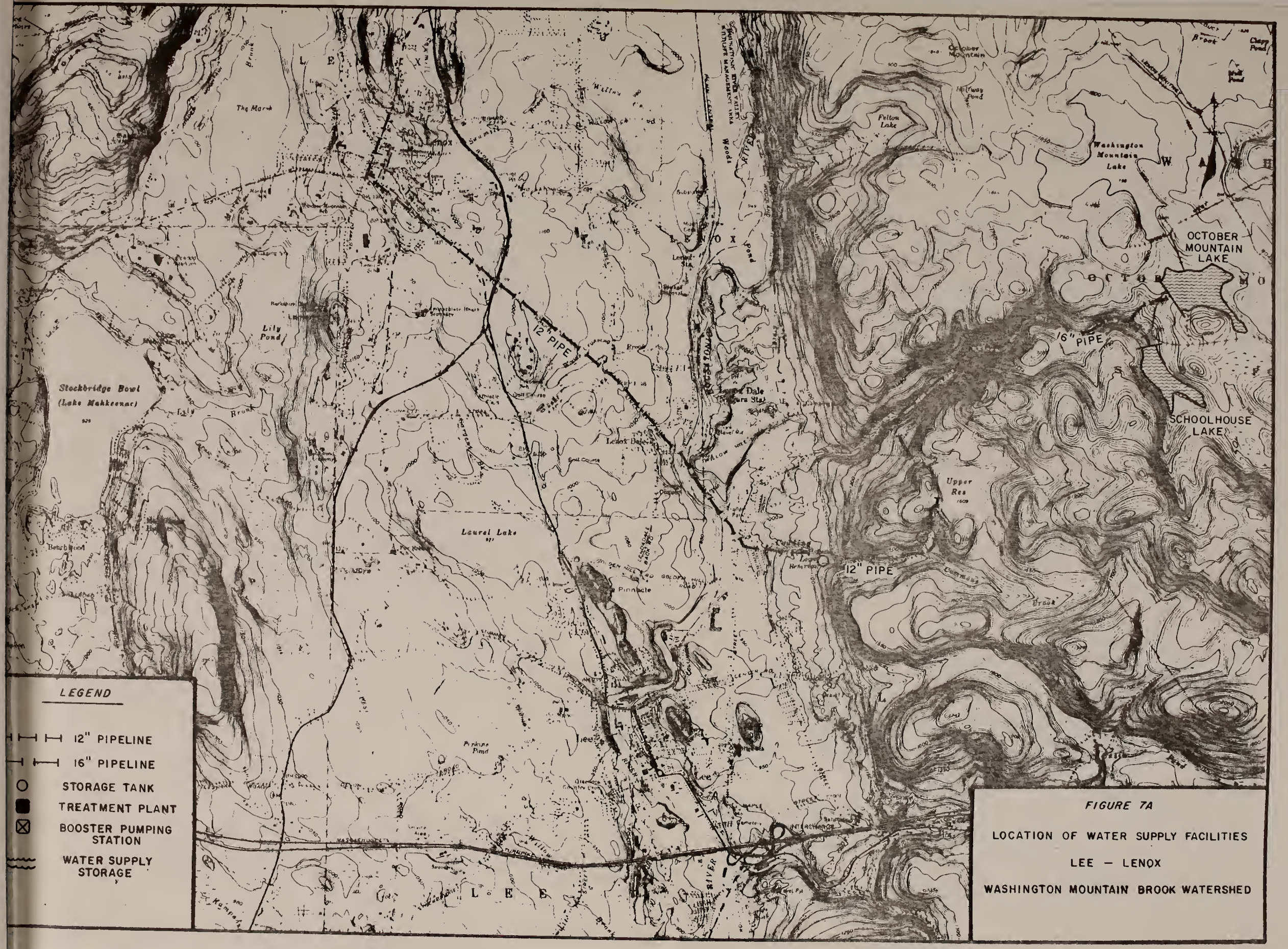


FIGURE 7A

LOCATION OF WATER SUPPLY FACILITIES

LEE – LENOX

WASHINGTON MOUNTAIN BROOK WATERSHED

Debris removal and excavation will be required through approximately 400 feet of stream (200' and 200'), to accommodate the control structures and provide the storage capacity. This excavation will total about 18,000 cubic yards. Of this total, approximately 3,000 cubic yards will be used or disposed of onsite. The remaining 15,000 cubic yards will be serviceable material and will be stockpiled, at the direction of the town of Lee, for future use.

Washington Mountain Road will serve as a construction and maintenance access road to the sediment control facilities. The road, to this point in the watershed, will not require extensive rehabilitation since it is presently used as an access to the water supply intake facilities.

Although Washington Mountain Brook in the lower portion of Reach 3 is a perennial stream, it has been modified in the past by sediment excavations, stream realignment, and road construction. The sediment control facilities will not impound water during normal flows of 0.5 to 1.5 csm (cubic feet per second per square mile of drainage).

Water Supply Facilities

The town of Lee will install a gravity flow pipeline to transmit the water from October Mountain Lake and Schoolhouse Lake to their Upper Reservoir on Codding Brook.

The pipeline would consist of approximately 2.9 miles of 16 inch pipe. It would follow Washington Mountain Road southwesterly, a distance of approximately 2.2 miles (Figure 1); then cross country southeasterly to the Upper Reservoir. The cross country portion of the line would require maximum cleared right-of-way of 20 feet in width. This would require clearing of approximately 1 to 1.5 acres of hardwood forest. Final design of the pipeline will seek to minimize the number of stream crossings to less than the five presently proposed.

Four fire hydrants will be installed at intervals of about 2,000 feet along Washington Mountain Road. Three of these will lie within the town of Washington and one within Lee.

Treatment of this water source will include filtration and disinfection. A water treatment plant with a capacity of 3.2 mgd (0.75 existing source + 2.45 mgd new development) would be located near the present Upper Reservoir. A 12-inch pipeline about 6,000 feet in length would be installed to convey water from the treatment plant to the low service system presently serviced through the Vanetti Reservoir. Since treatment will take place near the Upper Reservoir, the Vanetti Reservoir will be abandoned and replaced with a one MG storage tank, to meet peak demands. A two MG storage tank will be installed to supply water to the high service system. Pipeline facilities to service Lenox consist of about 4,000 feet of 12 inch pipe extending along Mill Street to the Lee-Lenox town boundary.

A 17,200 foot, 12 inch pipeline will be installed from the Lee-Lenox town boundary, along Walker Street, then Main Street to Hubbard Street. The location of these facilities are shown on Figure 7A.

Pollution Control

The final design of all structural measures and development of construction procedures will give maximum consideration to minimizing adverse effects to the environment. Erosion and other pollution control is a major concern. Requirements for erosion and pollution control are outlined in SCS Engineering Memorandum-66 and will be an integral part of construction contracts.

Final design of the water supply pipeline by Lee's consultant will include studies directed at minimizing the number of pipeline crossings of Washington Mountain Brook; the construction specifications for the pipeline work will include detailed site specific requirements for the control of erosion and silting.

The following measures and techniques will be considered in preparing the final construction plans and specifications.

- The area and duration of exposure of erodible soils will be reduced to the minimum extent practicable.

- No more than 2 acres of completed cuts or fills shall be unvegetated at one time. All completed cuts or fills shall be covered with permanent vegetation during the next seeding period.

- Soils will be protected by using temporary vegetation, mulch or accelerated establishment of permanent vegetation. Segments of work will be completed and protected as rapidly as practicable.

- Plant materials used for vegetating disturbed areas will be selected for their ability to control erosion, provide wildlife food and cover, and for beauty and ease of maintenance.

- The rate of runoff from the construction site will be mechanically retarded and the disposal of runoff will be controlled.

- Sediment resulting from construction will be trapped in temporary debris basins.

- Dust will be kept within tolerable limits on haul roads and at construction sites by application of methods acceptable under Regulation No. 9 of the State Air Pollution Implementation Plan.

- Temporary measures will be installed to control erosion if construction is suspended for any appreciable length of time.

- Protection against pollutants such as chemicals, fuels, lubricants, sewage, etc., will be provided for in the contract.

- Sanitary facilities will not be located over or adjacent to streams, wells or springs.

- Steps will be taken to protect against grass or brush fires.

In addition to construction techniques and procedures, the order in which construction takes place can minimize pollution and adverse environmental effects. Included in the final design plans will be one sheet detailing the Sequence of Operations. The significance of the sequence is illustrated by the following operations:

- Clearing of the reservoir pool areas can be done only after the runoff is diverted into the reservoir area and stream flow is through the pool drain and the principal spillway.

- The channel work will be completed following completion of the floodwater retarding structures, and will be accomplished in a downstream order.

The following measures and precautions will be included in the Special Provisions section of the construction contract.

- The Contractor shall exercise every reasonable precaution throughout the duration of the contract to prevent the silting of streams, rivers, and impoundments and to prevent excessive air and water pollution. The prevention of pollution shall be considered prior to starting any construction operation. The Contractor shall construct all ditches and diversions needed to prevent pollution and erosion during construction.

- The Contractor shall place temporary bridges or culverts at equipment stream crossings. He shall submit, for the Engineer's approval, the locations of proposed equipment stream crossings, along with the size and type of bridge or culvert.

- Before the start of construction the Contractor shall submit to the Contracting Officer his proposal for handling sanitary wastes.

- The Contractor shall provide positive means for collecting waste oil and grease. All such material shall be removed from the area. The Contractor shall not operate any equipment that is leaking fuel, oil or grease near the stream.

- If normal operating procedures and the measures listed herein do not provide the required degree of pollution control, the Contractor may be required to perform work that is necessary to control the pollution. Typical of such work is temporary seeding and/or mulching.

If special problems of pollution arise during construction, or measures not in the contract are needed, the contract will be modified or other appropriate action taken.

General

Installation of the structural measures will comply with the permit program for regulation of discharges of dredged or fill materials established by Section 404 of the Federal Water Pollution Control Act, as amended. A permit will be required for construction of Schoolhouse Lake, the channel work, the pipeline and treatment facilities. See Appendix A for a description of the permit program.

Contractors must comply with the Safety and Health Regulations for Construction Manual, published by the U.S. Department of the Interior, Bureau of Reclamation, and with state and local health, sanitation and pollution regulations.

An archaeological and historical survey (see page 69 and Appendix B) of the structure areas, conducted by a professional archaeologist, disclosed no evidence of archaeological resources that would be directly affected by installation of the structures. However, construction personnel will be made aware of the possibility of archaeological resources, particularly during removal of earth from borrow areas and the emergency spillway. If any discoveries are made during construction, work which might destroy the cultural property will be stopped and the Secretary of the Interior (through the appropriate field office of the Interagency Archaeological Services Division) and the State Historic Preservation Officer will be notified in compliance with the Archaeological and Historical Preservation Act (PL 93-291). Construction would not be continued until necessary actions have been taken, as specified in Title 7, Part 656 of the Code of Federal Regulations. Since this is a federally assisted local project, there will be no change in the existing responsibilities of any federal agency under Executive Order 11593 with respect to archaeological and historical resources.

No relocation of persons, businesses or farm operations will result from installation of the channel work or dams.

Mitigative Features

Soil Conservation Service policy, in response to Executive Orders 11988 and 11990, requires that, if certain impacts cannot be avoided through implementing a practicable alternative, then those impacts will be mitigated, to the extent possible.

Executive Order 11988, Floodplain Management, states that direct or indirect support of floodplain development should be avoided wherever there is a practicable alternative. This project, by lessening the flood hazard and reducing the area of flood prone land, may be interpreted as providing indirect support of floodplain development. Alternative plans, which could have avoided this impact were not considered practicable. Therefore, to mitigate this indirect support of floodplain development, the Soil Conservation Service will require the town of Lee to continue its participation in the National Flood Insurance Program. SCS project financial assistance is contingent upon the town of Lee converting to the Regular phase of the program, when eligible, and adopting at least the minimum regulations required by the Federal Emergency Management Agency.

Executive Order 11990, Protection of Wetlands, was issued, in order to avoid to the extent possible, the long and short term adverse impacts associated with the destruction or modification of wetlands. SCS policy requires that, for projects which include features for other purposes that unavoidably result in losses to types 1 through 20 wetlands, the loss is to be mitigated by establishing wetland habitat values in the same vicinity that are equivalent, insofar as possible, to the wetland habitat values lost.

The following features of the project resulted from environmental evaluations during planning, in direct response to Executive Order 11990, or comments received on the draft EIS. When completed, they will help to reduce the impact to fish and wildlife resources resulting from the planned project.

1. The watershed plan includes the provision for a waterway which will insure the protection of a 32.5-acre wetland which abuts the October Mountain Lake dike. This wetland consists of 0.1 acre of type 3, 0.1 acre of type 6, 3.5 acres of type 2 and 28.8 acres of type 7 wetland.

   A protected grassed waterway will be installed at the outlet of this wetland to prevent outlet erosion and channel cutting which would ultimately result in the drainage of the wetland. After construction, the waterway will be seeded to tall fescue and red fescue to provide forage for wildlife. The waterway will result in the reduction of 2 acres of primarily pole size red spruce which occurs in a large red spruce stand. The Massachusetts Water Resources Commission, Division of Water Resources, will maintain the grassed waterway by periodic mowing or selective removal of woody plants which establish in the waterway. Lime and fertilizer will be applied as necessary to maintain a dense, healthy sod.

2. The management authority of Finerty Pond and its watershed will be transferred from the town of Lee to the Massachusetts Department of Environmental Management, Division of Forests and Parks. Finerty Pond will no longer be used as a public water supply storage reservoir. A permanent pool elevation will be maintained and the warm water fishery, beaver and other biota will no longer incur periods of pool drawdown as has occurred in the past whenever water was needed for public uses. A stable water level at this site is expected to especially benefit beaver. Of the 0.76 miles of shoreline around Finerty Pond there is 0.64 miles (84 percent) which is dominated by hardwood woodland.

   The access to Finerty Pond will be kept in its unimproved road condition. The road is suitable for hikers and four wheel drive vehicles. Hikers and fishermen will be the primary users of Finerty Pond and its watershed.

3. Washington Mountain Lake will have 55 acres of water less than 10 feet deep which will succeed to wetland types. Of this, 18 acres of water will be 3 feet deep or less and will succeed to wetland types 2 thru 4 during the project life. Thirty-seven acres will be 3 feet to 10 feet deep which will succeed to type 5 wetland. One island 0.6 acre in area will be present in the permanent pool.

4. There are 16 inactive beaver flowages in the watershed that currently contain about 86 acres of wetland. These flowages have been intentionally breached and beaver colonies destroyed in recent years in order to maintain water flow to the town water intake. With installation of the two water supply reservoirs, the inactive beaver flowages will likely be reoccupied by beaver. These wetlands would be larger and deeper wetland types with active beaver colonies at the sites. With the water supply reservoirs, there will no longer be any purpose to breaching beaver dams or destroying beaver colonies. Establishment of beaver colonies at unoccupied sites is expected by means of immigration of 2 year old beaver from other colonies.

   The 3.5 miles of shoreline around Washington Mountain Lake will have 2.2 miles (63 percent) of hardwood dominated woodland. Based on typical beaver colony densities of one colony per mile of shoreline on nondeveloped lakes and reservoirs the Washington Mountain Lake and its shoreline is expected to support two beaver colonies. Historically, it is known that the Washington Mountain Lake area did support beaver, however, the remains of only one beaver lodge is still evident.

5. Ten to 15 wood duck nesting boxes will be installed in and around Finerty Pond, Washington Mountain Lake and beaver flowages, once they become occupied by active beaver colonies. These boxes will be maintained for a period of 5 years. Annual wood duck production from these boxes will be recorded and at the end of the 5 years the program will be evaluated. If reasonable use has been made of the boxes by ducks the program will be expanded. A 15 percent or higher use of the boxes is generally considered an effective level.

   All nesting boxes will be constructed with predator guards. All boxes will be inspected annually, repaired or replaced as necessary and old nesting material will be removed and replaced with fresh nesting material.

6. Of the 5,740 acres in the watershed, 5,150 acres (90 percent) are part of the October Mountain State Forest. Within this 5,150 acres, there are presently only 23.4 acres of grassland or open land vegetation. This total is comprised of 11.1 acres of AT&T buried cable strip, a 5.7-acre field, a 4.6-acre field and 2 acres of open grass cover created during installation of the Washington Mountain Lake dam and dike. Open or grass dominated acreage presently constitutes only 0.5 percent of the watershed area lying within the state forest. Installation of October Mountain Lake and Schoolhouse Lake will add 9 acres and 21 acres, respectively, of grassed acreage to the state forest area. Open grassland is a desirable vegetative component of high value for wildlife on this heavily forested state forest.

   To retain the grassland acreage in the state forest (present and future with project amount) will require maintenance involving mowing, fertilizing and liming.

The two fields now existing on the state forest have been and will continue to be maintained by the Division of Forests and Parks.

The 30 acres of grassland which will result from the installation of October Mountain Lake and Schoolhouse Lake will be maintained by the Massachusetts Division of Water Resources. The 2 acres of grassland at the Washington Mountain Lake dam and dike will also be maintained by the Division of Water Resources.

The American Telephone and Telegraph Company will be encouraged to maintain grass or herbaceous cover rather than allow succession to woody plants.

A planting plan will be developed for the October Mountain and Schoolhouse Lake sites which will emphasize both visual and wildlife resources. The plantings will consist of shrub and tree species of high wildlife value to indigenous wildlife species. Wildlife travel lanes, protective cover and food value are all features which will be considered when selecting plant species to be planted. The Massachusetts Division of Fisheries and Wildlife will assist the Soil Conservation Service and Massachusetts Division of Water Resources in the development of the planting plans.

7. The Massachusetts Division of Fisheries and Wildlife (with prior consultation with the Division of Forests and Parks) will be responsible for developing and managing the pool fisheries at Washington Mountain Lake and October Mountain Lake. Initial stockings, fish population management, and use are all within the authority of the Division.

8. The Division of Fisheries and Wildlife will assist the Division of Forests and Parks in the development of management plans on the October Mountain State Forest. Technical assistance as requested will be provided by the Berkshire Conservation District through the SCS. Division of Fisheries and Wildlife inputs will focus on management features which will result in increasing the quality of wildlife habitat in the state forest. This will be an ongoing procedure with inputs provided when management plans are initially developed and when updated or revised.

   To compensate for the terrestrial habitat values attributed to the 322 acres affected by the planned project would require that habitat values be increased, through management, on about 600 acres.

9. When October Mountain Lake is used for water supply on a year-round basis, the town of Lee will replace the acreage of dedicated land lost as a result of the water supply storage by providing the Department of Environmental Management with an additional 34 acres of land or providing monetary compensation not to exceed the sum of $10,540.00. When this occurs, emphasis will be placed on acquiring land with wildlife habitat values similar to those adversely affected by the project.

Operation and Maintenance

General

A successful watershed project is comprised of three broad phases: planning, installation, and operation and maintenance. While planning is essentially continual through completion of the installation phase, operation and maintenance must be performed throughout the planned life of the measure. The operation and maintenance phase is critical and requires effort and expenditures throughout the useful life (planned project life, plus) of the project.

Operation is the administration, management and performance of nonmaintenance actions required to keep completed works of improvement functioning as planned and designed.

Maintenance is work required to keep works of improvement in, or restore them to their original physical and/or functional condition.

Maintenance includes performance of work to prevent deterioration, as well as, restoring, rebuilding, replacing, or repairing, parts or materials that have been broken, or deteriorated.

An Operation and Maintenance Agreement will be executed between the Soil Conservation Service and the appropriate sponsor prior to issuing the invitations to bid on the works of improvement. This is a binding agreement that details the action each is to take in the operation and maintenance of the works of improvement. A plan of operation and maintenance detailing the routine needs is included in the agreement. A separate plan is included for each measure or group of measures where the routine operation and maintenance needs are expected to be different.

The Massachusetts Water Resources Commission is to insure that all operations and maintenance needs are performed on all works of improvements in which the Commonwealth of Massachusetts expended funds for installation.

Land Treatment

Operation and maintenance of the forest land treatment measures will be the responsibility of the Massachusetts Department of Environmental Management, Division of Forests and Parks. Technical assistance will be provided by the Berkshire Conservation District, the Soil Conservation Service, and the U.S. Forest Service.

Structural Measures

The Massachusetts Water Resources Commission, Division of Water Resources will be responsible for the operation and maintenance of the impoundment structures, including related waterways.

An operation and maintenance agreement between the Soil Conservation Service and the Massachusetts Division of Water Resources is in effect for the Washington Mountain Lake structure. A similar agreement will be executed prior to issuing the Invitation to Bid for construction of the October Mountain Lake and Schoolhouse Lake structures.

The operation and maintenance work at the impoundment sites will include such activities as the removal of brush and debris around the dam and spillways; maintenance of vegetal cover by reseeding, fertilizing, and mowing; control of unwanted vegetation; and replacement or repair of the metal and concrete appurtenances.

The principal item of operation and maintenance of the two recreational pools is initial fish stocking and fishery management to be accomplished by the Massachusetts Division of Fisheries and Wildlife. This will normally be initiated within 2 years after the impoundments have been filled with water.

The town of Lee will be responsible for the operation and maintenance of the channel work, the appurtenances at the October Mountain Lake and Schoolhouse Lake Dams related to water supply, the water supply pipeline (except in Lenox),and treatment facilities.

An operation and maintenance agreement between the town of Lee and the Soil Conservation Service will be executed for the channel work. Operation and maintenance of the channel work will include maintaining the structural integrity of the sediment control facilities and constructed channel, removal of sediment from the control facilities, removal of any sediment deposits in the constructed channel and at bridges, and maintaining access to the sediment control facilities.

The Sponsors and the Soil Conservation Service will inspect the dams and the channel work annually and after each major storm or unusual occurrence which might adversely affect the measures. The initial inspection of the dams will be performed during or immediately after the initial filling of the reservoirs. Needed maintenance will be determined by the inspections. In conformance with state law, the Massachusetts Water Resources Commission is responsible to insure that needed maintenance is performed.

The water supply facilities will require maintenance and replacement, as necessary. This will be the responsibility of the town of Lee.

Maintenance work and work resulting from improper operation and maintenance are not eligible for PL-566 financial assistance. However, PL-566 funds may be used to cost share for additional work on vegetative applications on completed measures, if the original application fails to establish vegetation through no fault of the contractor or those responsible for operation and maintenance. Also, PL-566 funds may be used to cost share on repair work resulting from unknown conditions or design or construction deficiencies. Technical assistance that may be needed for maintenance work and work resulting from improper operation and maintenance will be provided by the Soil Conservation Service.

Project Costs

The total estimated installation cost of the remaining project measures is $9,970,800. Components of this cost are shown in Table 2. Cost and benefit data for the project are included in Appendix A.

TABLE 2

PROJECT COSTS[1/]

Item	Project Costs (dollars) PL-566[3/]	Other[4/]	Total
Washington Mountain Lake	-	200,000[5/]	200,000
October Mountain Lake[2/]	360,800	524,700	885,500
Schoolhouse Lake	553,600	520,000	1,073,600
Channel Work	365,400	600	366,000
Water Supply Pipelines, Intakes, Chlorinator, Storage Tanks, and Treatment Plant		5,863,800	5,863,800
Allocated Costs - Subtotal	1,279,800	7,109,100	8,388,900
Project Administration	313,800	1,268,100	1,581,900
TOTAL	1,593,600	8,377,200	9,970,800

1/ Remaining installation costs as of December 1980, except as noted below.

2/ Includes $38,000 incurred from previous project activity.

3/ Funds appropriated under authority of PL-83-566 for installation of project measures.

4/ Funds from sources other than PL-83-566 appropriations. Other funds may include sponsors costs, donations, landowners and operators costs, and cost-sharing from other public programs.

5/ Estimated remaining land rights cost (utility relocation).

ENVIRONMENTAL SETTING

Physical Resources

Area and Location

The Washington Mountain Brook Watershed lies within the drainage basin of the Housatonic River in western Massachusetts, approximately 105 miles west of Boston, 40 miles southeast of Albany, New York, and 45 miles northwest of Hartford, Connecticut. The brook's drainage area, 5,740 acres is within Berkshire County, and includes portions of three towns: Lee (870 acres), Washington (4,670 acres), and Becket (200 acres). Approximately 5,150 acres of the watershed is within the October Mountain State Forest. Principal uses of the watershed are recreation and timber production.

The Washington Mountain Brook Watershed is in the New England Region, numerically designated by the U.S. Water Resources Council as 01100005 (Figure 8).

Climate

The nearest U.S. Weather Bureau station to the Washington Mountain Brook Watershed is located at Becket, where only precipitation is monitored and the period of record is 2 years (NOAA-Environmental Data Service, 1974). Data used in the following discussion were collected at Stockbridge, approximately 5 miles west of the watershed. The station at Stockbridge is located at an elevation of 870 feet above mean sea level (msl), which is equivalent to the lowest elevations in the Washington Mountain Brook Watershed. Mean data used in the following discussion include the period from 1941 to 1970.

The climate of the area is generally continental with occasional maritime intrusions. General climatic features include changeable weather, a substantial temperature range (both daily and seasonal), and a relatively even distribution of precipitation.

The average annual temperature at Stockbridge is 45.7 degrees Fahrenheit (°F) (Table 3). The average summer (June-August) temperature is 65.4°F, and the average winter (December-February) temperature is 24.0°F. The average winter minimum temperature is -16°F. In general, summers are free of extreme or very uncomfortable heat; winters are cold but not extremely severe.

The average "growing season," or period with minimum temperature exceeding 32°F is 127 days and extends from mid-May to the end of September. The length of the growing season varies with elevation, topography, soil type, and other influences. Low areas are generally more frost prone than higher slopes and rises. Local variations in the appearance of the first frost may amount to several weeks.

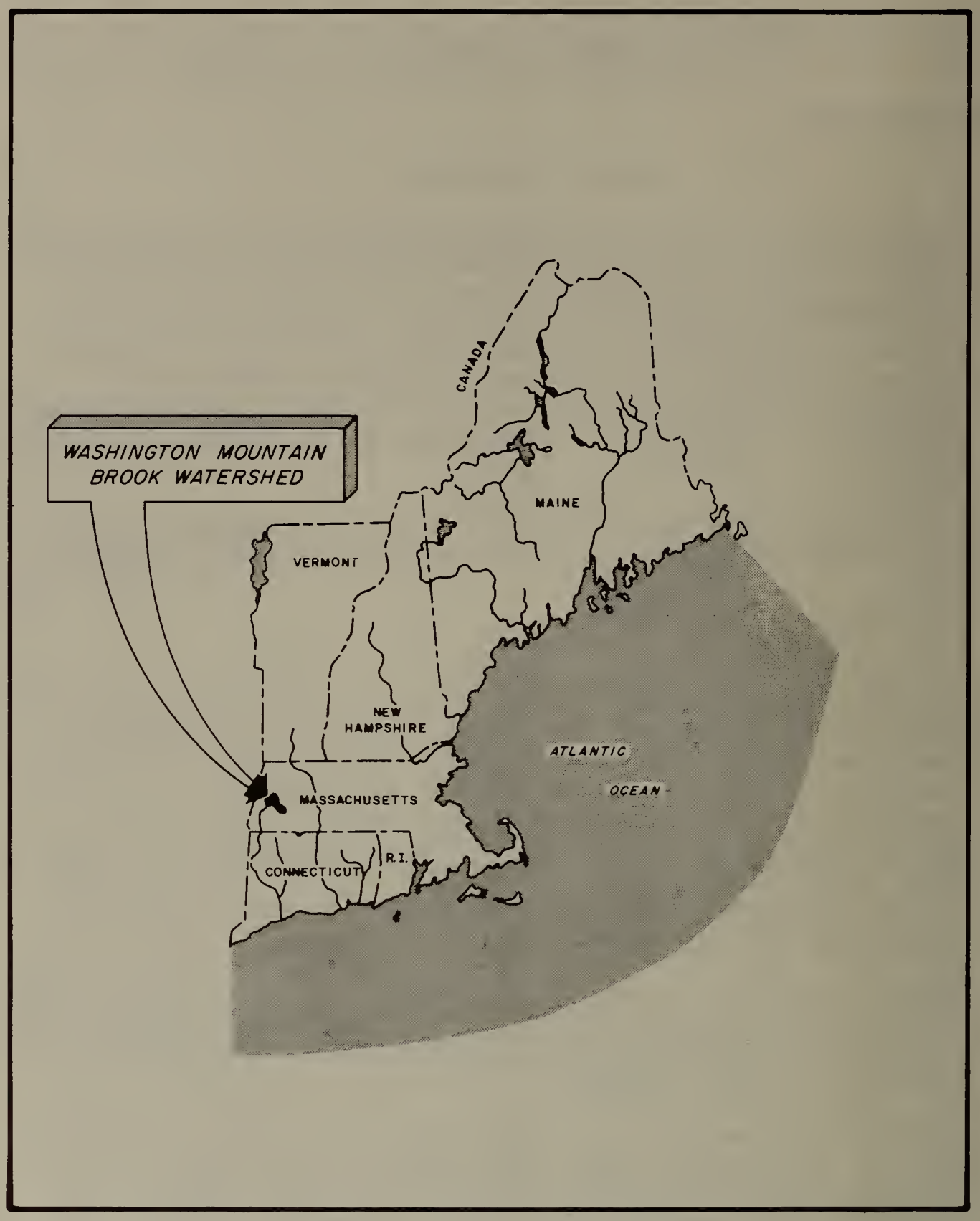


FIGURE 8

LOCATION OF THE WASHINGTON MOUNTAIN BROOK WATERSHED
WITHIN THE NEW ENGLAND REGION

TABLE 3

CLIMATOLOGICAL DATA

AVERAGE TEMPERATURE, TOTAL PRECIPITATION
AND SNOWFALL AT STOCKBRIDGE, MASSACHUSETTS
FROM 1941 TO 1970
[SOURCE: National Oceanic and Atmospheric Administration (1973)]

Month	Temperature (F°)	Precipitation (inches)
January	22.1	2.88
February	23.8	2.67
March	32.6	3.13
April	44.8	3.75
May	55.0	3.63
June	63.3	3.92
July	67.6	4.41
August	65.4	3.42
September	58.7	3.78
October	49.4	2.90
November	38.9	3.95
December	26.2	3.55
Annual	45.7	41.99

Total annual precipitation in the area averages 41.99 inches (Table 3) and exceeds 90 percent of this average in 7 of every 10 years. Although there are no "rainy" or "dry" seasons, short dry periods are fairly common. During the warmer half of the year much of the rainfall comes from showers and thunderstorms accompanying the passage of a front. During the colder seasons precipitation is sometimes augmented by "northeasters" which can produce strong winds and heavy rain or snow in the area.

Total annual snowfall at Stockbridge is 66.6 inches, but seasonal snowfall varies widely from the average. The maximum depth of snowcover averages 16 inches. However, measurable depths of snowcover do not cover the ground for extended periods of time. The average period of continuous snowcover at Stockbridge is 46 days.

Air Quality

The nearest air quality monitoring station to the Washington Mountain Brook Watershed is located at the sewage treatment plant in the town of Lee.

According to the Berkshire Air Pollution Control District (BAPCD), air quality in the vicinity of Lee is excellent. Air quality in most portions of the watershed would be expected to be better than that in the town of Lee due to the lack of air pollution sources and the freer circulation of air at the higher elevations.

Topography

Elevations in the Washington Mountain Brook Watershed range from 2,200 feet above mean sea level (msl) at its headwaters to 900 feet msl at its confluence with the Housatonic River. The watershed lies within two sections of the New England Physiographic Province: the upland plateau and the limestone valley.

The brook originates in the upland plateau where elevations range from 1,750 to 1,900 feet msl with isolated hills rising to 2,200 feet msl. The stream flows west alternately through somewhat broad, gently sloping valleys and steep, V-shaped valleys. The more gently sloping portions of the valleys are often flooded by beaver dams creating swamps, marshes and shallow ponds. The western edge of the upland plateau is an abrupt escarpment.

The brook flows from the upland plateau into the limestone valley through a steep, V-shaped valley which is approximately 400 feet deep where it dissects the mountain front. Elevations in the limestone valley range from 1,000 to 1,750 feet msl. The stream channel is confined to a V-shaped valley with steeply sloping banks. The average stream gradient in this section is approximately 320 feet/mile. Numerous unstable bank and slide areas in various stages of erosion and sloughing are scattered throughout this area.

Geology

Bedrock of the Housatonic Basin is primarily sandstone, limestone, dolomite, marble, quartzite, schist and gneiss. These rocks have been substantially deformed by tilting, folding and faulting. The deformation processes have caused cracks and broken zones which now constitute the major water-bearing openings in the bedrock.

Gneissic rocks, consisting primarily of granitic gneiss with some schist and quartzite, underlie most of the watershed (Figure 9). Gneissic rocks in the Housatonic Basin include the Hinsdale Gneiss, the Becket Granite Gneiss, the Washington Gneiss, and some Lee Quartz Diorite, all of Precambrian age.

Quartzitic rocks occur in a narrow band across the watershed near the Housatonic River (Figure 9). In the Housatonic Basin, these rocks consist primarily of quartzite, quartzite conglomerate, feldspathic quartzite, and some mica schist. Some surface outcrops appear as a friable sandstone. Quartzitic rocks include the Dalton Formation of early Cambrian age, the Cheshire Quartzite of early Cambrian age, and micaceous quartzites within the Stockbridge Group of Cambrian and Ordovician age.

Carbonate rocks, consisting principally of limestone, dolomite, and marble, underlie the watershed near the Housatonic River (Figure 9). These rocks include members of the Stockbridge Group of Cambrian and Ordovician age and the Coles Brook Limestone of Precambrian age.

Sufficial deposits within the Housatonic River Basin, excluding swamp and recent alluvium, are glacial in origin. These deposits are composed of rock particles ranging in size from clay to boulders. Surficial deposits are classified, according to the mode of deposition, as stratified deposits (glaciofluvial and glaciolacustrine) and nonstratified (till) deposits. The Washington Mountain Brook Watershed contains both stratified surficial deposits and nonstratified deposits (Figure 10).

Washington Mountain Brook has been depositing an irregularly shaped alluvial fan at the base of the mountain front since the retreat of the Pleistocene glaciers. The alluvial fan materials are coarse sands, gravel, cobbles and boulders. The fan generally extends from the Housatonic River upstream to the vicinity of the Newton Bridge (northeast end of Reach 2, see Figure 1).

Stratified surficial deposits cover the watershed near the Housatonic River (Figure 10). The deposits consist primarily of silt, sand, gravel, and boulders. Some clay appears in well to poorly sorted deposits. Stratified deposits occur principally as valley bottom fill, kame deltas, and ice channel fillings. These deposits are principally glaciofluvial and glaciolacustrine deposits of Pleistocene age and some swamp, stream, and lake deposits of recent age. The thickness of these deposits ranges from 0 to 240 feet.

FIGURE 9 BEDROCK GEOLOGY
WASHINGTON MOUNTAIN BROOK WATERSHED

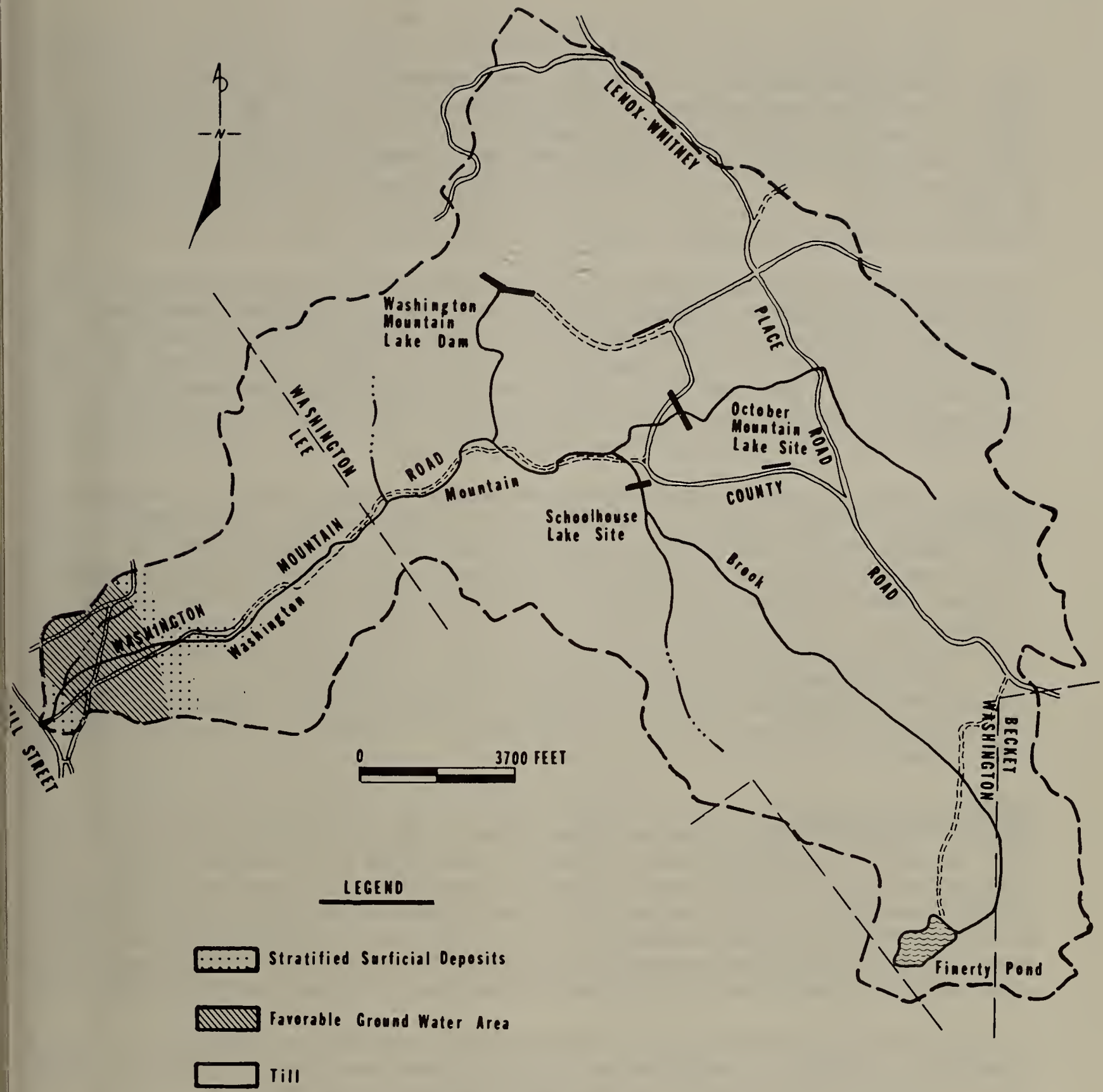


FIGURE 10 SURFICIAL GEOLOGY
WASHINGTON MOUNTAIN BROOK WATERSHED

Till, a heterogeneous mixture of silt, sand, gravel, and boulders, with small quantities of clay, overlies most of the watershed (Figure 10). Till deposits range in thickness from 0 to 90 feet, and occur as a discontinuous mantle over bedrock and as thicker deposits in drumlins (glacially molded elongated hills). Till deposits occur most frequently on the hills in Berkshire County. Because till was deposited directly from the glaciers, and not transported by water, the material is normally poorly sorted.

Ground water in Berkshire County occurs in both surficial and bedrock deposits. Ground water resources in the vicinity of the Washington Mountain Brook Watershed have been evaluated by Norvitch (1966), the Commonwealth of Massachusetts Water Resources Commission (WRC) (1967), and Norvitch et al., (1968, proposed that the stratified deposits near the confluence of the Housatonic River and Washington Mountain Brook are a favorable area for ground water exploration).

Bedrock contains ground water only in secondary openings such as, fractures, joints, and solution cavities, within the rock formations. The volume of water and rate of production are dependent upon the size and degree of interconnection of these openings. The largest and most extensive secondary openings normally occur in carbonate bedrock. Reported yields from wells in carbonate rocks range from less than 1 gallon per minute (gpm) to as much as 1,700 gpm (WRC, 1967). The median yield for carbonate rocks is 9 gpm. The other bedrock units in the area are relatively insoluble and yield large quantities of water only where they are highly fractured. The median yield from these units is also 9 gpm, but yields exceeding 100 gpm are common.

Surficial deposits contain the largest quantities of recoverable ground water in the vicinity of the watershed (Figure 10). The stratified surficial deposits in the Housatonic Valley are generally well sorted. These deposits often yield large quantities of ground water. Norvitch et al., (1968) reported that the coarseness of the grains in the stratified deposits south of Woods Pond in the town of Lee was sufficient to warrant ground water exploration. These authors also noted that each of two wells in this area currently supply more than 1 million gallons of water per day (mgd).

The deposit, part of which occurs in the Washington Mountain Brook Watershed, is extensive and has not been completely explored. Till deposits are normally poorly sorted and yield small quantities of ground water. Large diameter wells in till deposits generally produce sufficient water for domestic use.

Mineral resources of economic importance produced in Berkshire County include limestone, sand and gravel. A gravel extraction operation is located in the Washington Mountain Brook Watershed near the confluence of the brook and the Housatonic River (Figure 11). Large quantities of valuable mineral resources are not expected to be present in the upland portion of the watershed, but the presence of small deposits is possible (Dr. Norman Hatch, Jr., USGS, Reston, Va., personal communication).

Earthquakes in the northeastern United States have not been frequent or intense in comparison to other areas of the world. Earthquakes have not been recorded recently in the Berkshire Mountains. Although the area in the vicinity of the Washington Mountain Brook Watershed contains some faults, these fractures are very old and have not been active for an extremely long period of time. Young developing faults have not been detected during recent geological examinations of the area.

Soils

A detailed soil survey is currently being prepared for Berkshire County by SCS. Advance copies of aerial photographs of the Washington Mountain Brook Watershed with preliminary soil survey data imposed upon them were made available for incorporation into this report. Soils delineated on the aerial photographs were identified using the identification legend of Scanu and Zayach (1971), and soil characteristics were taken from Description of Soil Series and Land Types, an undated publication of SCS.

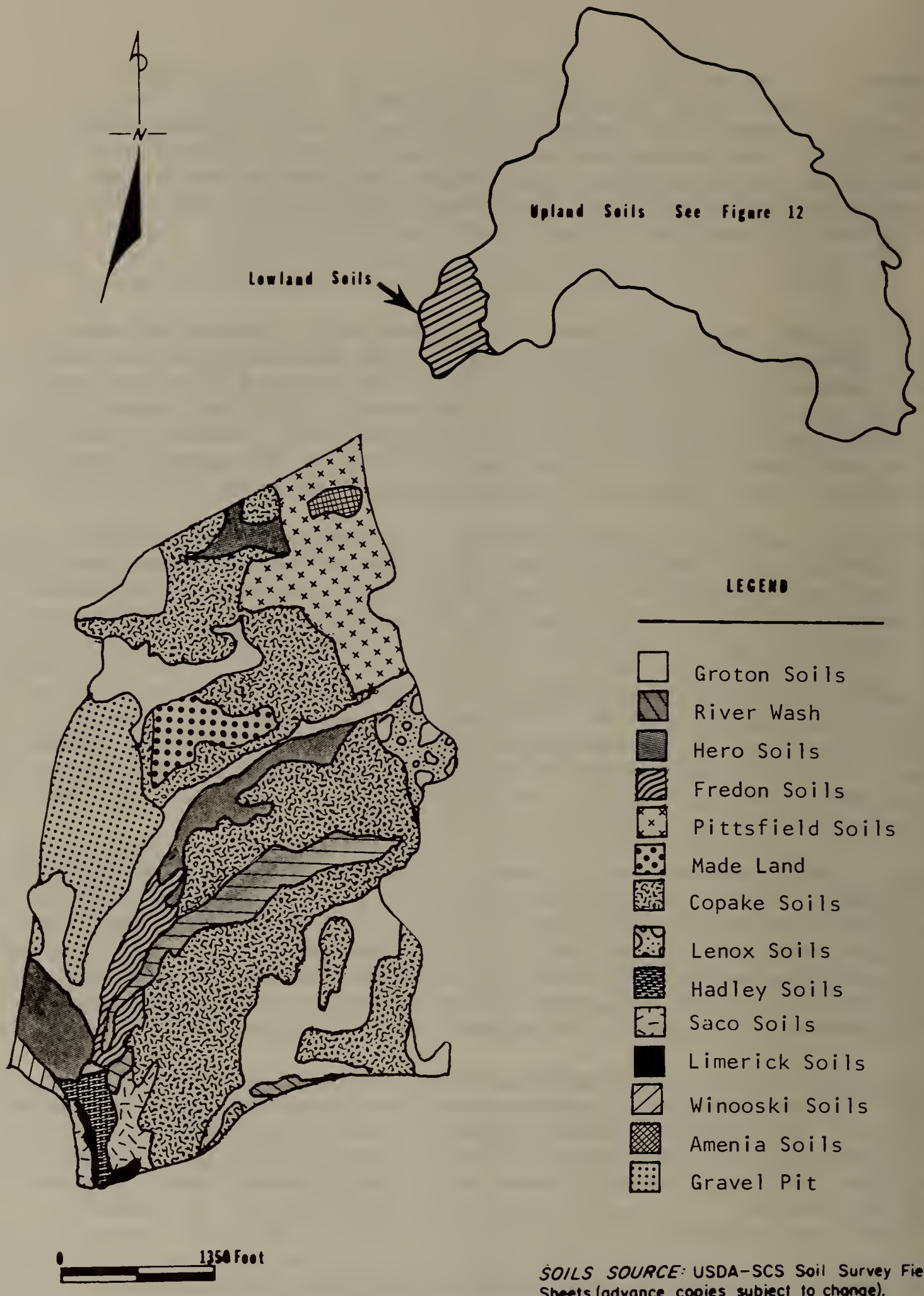
A preliminary soil map prepared from the aerial photographs indicates that a distinct division of soils exists at the approximate elevation of 1,100 feet msl. Lowland soils, those below 1,100 feet msl, in the watershed do not appear above this elevation, and upland soils, those occurring above 1,100 feet msl, do not appear below this elevation (Table 4).

Lowland soils in the watershed (Figure 11) include members of 14 different series of land types (Table 4). The most prominent lowland soil is the Copake sandy loam. The lowlands also contain substantial areas of Groton gravelly loamy sand and Pittsfield fine sandy loam (including the stony and extremely stony varieties). The lowlands are divided by an exposure of riverwash along the Washington Mountain Brook.

Copake soils have been formed in sand and gravel deposits consisting mainly of limestone, schist, and phyllite. The soils have a fine sandy loam or a gravelly loam texture to a depth of approximately 24 inches. The underlying substratum consists of stratified sands and gravel, and many contain cobbles and some stones. The surface soil and subsoil have a moderately rapid permeability, and the underlying sand and gravel layers are very rapidly permeable. The soils are somewhat excessively drained.

Groton soils formed in thick deposits of neutral or calcareous sands and gravel. The sands and gravel were derived from limestone, phyllite, schist, and gneiss. Soils of this series commonly have a gravelly surface soil and subsoil underlain by stratified sands and gravel. The soils generally have loose substrata, and water moves very rapidly through them. They are excessively drained. The soils are usually stone-free but may contain a few stones and cobbles.

Pittsfield soils formed in glacial till derived mainly from limestone and schist. These soils have a loam or a fine sandy loam surface soil and a subsoil that contains moderate quantities of cobble and stone. They are friable to a depth of 30 inches or more from the surface. The soils have moderately rapid to rapid permeability and are well drained. Pittsfield soils have very stony or extremely stony surfaces except where they have been cleared of surface stone.



SOILS SOURCE: USDA-SCS Soil Survey Field Sheets (advance copies subject to change).

FIGURE 11 LOWLAND SOILS
WASHINGTON MOUNTAIN BROOK WATERSHED

Riverwash is a miscellaneous land type consisting of sandy or gravelly material recently deposited by streams and rivers. Riverwash may also contain cobbles and large stones. Riverwash areas are subject to frequent stream overflow and are generally barren with little or no vegetation.

Upland soils in the watershed (Figure 12) include members of 11 different series or land types (Table 4). Upland soils occur in both the limestone valley and the upland plateau of the watershed. The most prominent upland soil is the Lyman extremely rocky loam. This soil dominates the limestone valley area of the watershed but also occurs in the upland plateau. Other prominent soils include the Ridgebury very stony and extremely stony loam, the Sutton extremely stony loam, and the Peru very stony loam. The upland plateau also contains areas of muck, peat and freshwater marsh. Approximately 10 percent of the upland area has not been surveyed.

Lyman soils developed in glacial till derived principally from schistose rock. The depth to bedrock is generally less than 20 inches. Distances between rock outcrops range from approximately 10 to more than 100 feet. The soils have a friable fine sandy loam or a loam surface soil and subsoil. They have moderately rapid permeability to bedrock and are somewhat excessively drained. These soils are very stony or extremely stony except where surface stones have been removed.

Ridgebury soils formed in compact, stony, glacial till. The soils have a fine sandy loam or a loam surface soil. The texture of the subsoil is fine sandy loam or sandy loam. A slowly permeable hardpan generally occurs at depths of 12 to 24 inches. Permeability of the soil above the hardpan is moderately rapid to rapid, but the soils are poorly drained. These soils are normally saturated with water for 7 to 9 months of the year by a perched water table near the soil surface. Ridgebury soils have a very stony or extremely stony surface and contain some stones below the surface.

Berkshire soils developed in glacial till which contained many fragments of mica schist. These friable soils have a fine sandy loam or a loam surface soil and subsoil. The soils have moderately rapid permeability and are well drained. Berkshire soils are very stony or extremely stony except where they have been cleared of surface stones.

Sutton soils formed in glacial till derived principally from schist and gneiss. The soils have a friable, fine sandy loam or loam surface soil and subsoil. The surface soil and subsoil have moderately rapid to rapid permeability. The soils are moderately well drained; they are generally wet below depths of 18 to 30 inches for 4 to 5 months of the year. Saturation generally occurs in winter and early spring, and is related to fluctuating high water tables or to excess seepage from adjacent higher areas. Sutton soils are very stony or extremely stony except where cleared of surface stones.

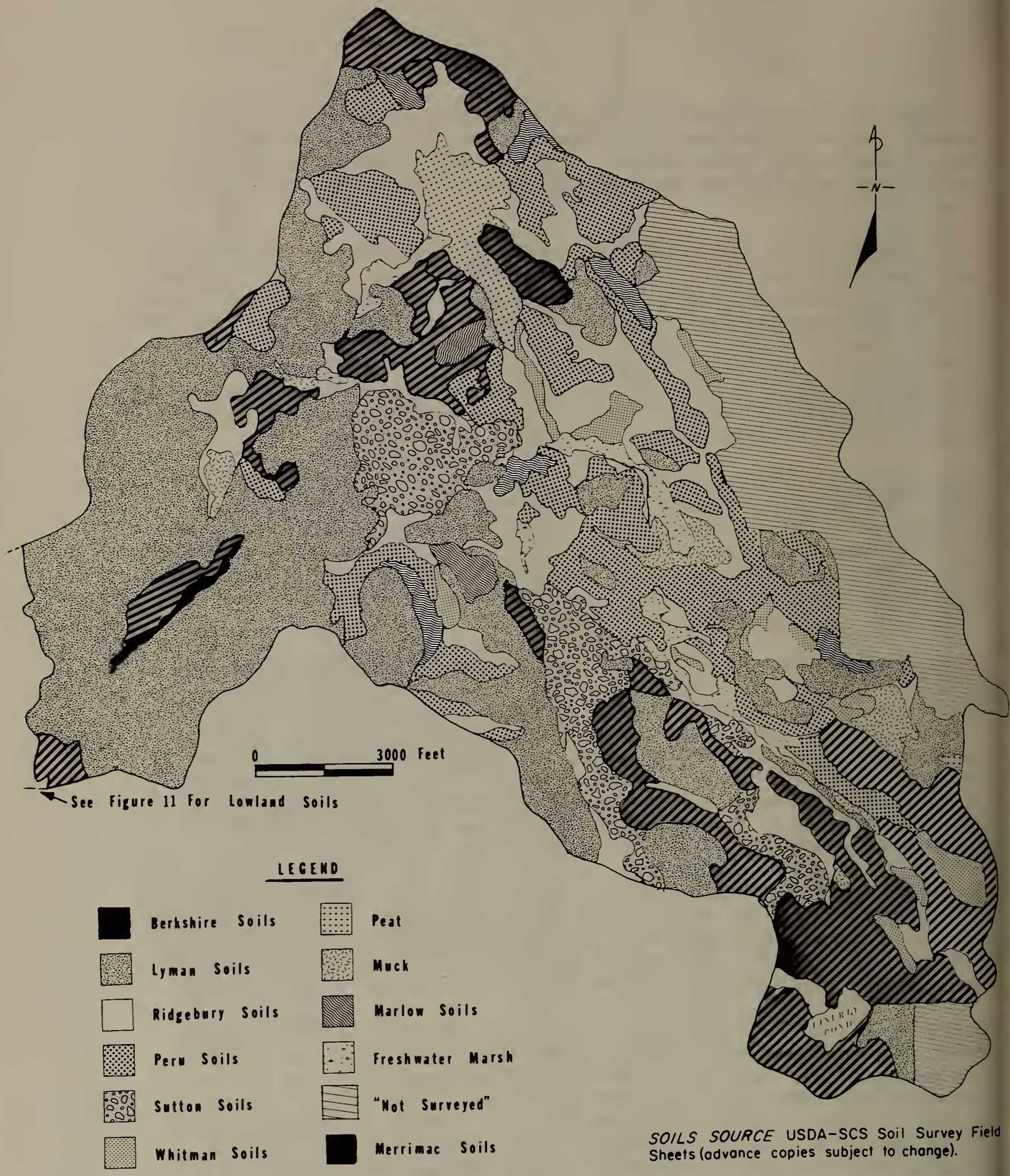


FIGURE 12 UPLAND SOILS
WASHINGTON MOUNTAIN BROOK WATERSHED

TABLE 4

SOILS OCCURRING IN THE WASHINGTON MOUNTAIN BROOK WATERSHED
[SOURCE: Advance copies of aerial photographs and accompanying identification legend. Scanu and Zayach (1971)].

Lowland Soils

Riverwash
Saco silt loam
Made land
Hadley silt loam
Winooski silt loam
Limerick silt loam
Lenox very stony loam
Pittsfield fine sandy loam
Pittsfield very stony fine sandy loam
Pittsfield extremely stony fine sandy loam
Amenia extremely stony fine sandy loam
Groton gravelly loamy sand
Copake fine sandy loam
Hero fine sandy loam
Fredon fine sandy loam
Gravel pit

Upland Soils

Ridgebury very stony and extremely stony loam
Whitman loam
Whitman very stony and extremely stony loam
Merrimac sandy loam
Peat
Muck
Lyman very rocky loam
Sutton extremely stony loam
Freshwater marsh
Lyman extremely rocky loam
Berkshire very stony loam
Berkshire extremely stony loam
Marlow very stony loam
Marlow extremely stony loam
Peru loam
Peru very stony loam
Peru extremely stony loam

Peru soils developed in compact glacial till derived from schistose rock. The soils have a friable, fine sandy loam or a loam surface soil and subsoil. Compact hardpan occurs at depths of 18 to 30 inches. Permeability is moderate in the surface soil and subsoil, and is slow in the hardpan. The soils are moderately well drained. Peru soils have a seasonally high water table or excess seepage water within 18 to 30 inches of the surface during 4 to 5 months of the year. These soils are very stony or extremely stony except where they have been cleared of surface stones.

Land Use

The 5,740-acre Washington Mountain Brook Watershed is 88.2 percent forested. This forest land includes 120 acres of wooded swamp. Ninety percent of the watershed is located within the October Mountain State Forest, which is administered by the Massachusetts Division of Forests and Parks. The primary land management objective is timber production. Secondary objectives include outdoor recreation, wildlife habitat, and watershed management. Ponds, streams and wetlands constitute 5.3 percent (3.2 percent excluding wooded swamp) of the watershed. Pasture, hayland, idle agricultural land, and cleared forest land comprise 5.0 percent of the watershed. The remaining 3.6 percent is urban land area.

Surface Water Resources

The Washington Mountain Brook Watershed currently contains one permanent lake, Finerty Pond; a flood control structure, Washington Mountain Lake Dam; a supplementary water supply intake structure; and approximately 12.3 miles of stream.

Washington Mountain Brook originates at an elevation of approximately 1,800 feet msl and joins the Housatonic River at an elevation of 900 feet msl. The average gradient of the entire stream is 100 feet/mile. The gradient profile of the Washington Mountain Brook is illustrated in Figure 13. The brook is a dendritic stream system composed of first and second-order streams (Figure 14). Based upon the classification system proposed by Horton (1945), first-order streams have no tributaries, and second-order streams have only first-order streams as tributaries. Stream order increases whenever two streams of the same order unite. Thus, when two first-order streams unite, a second-order stream is formed. Approximately 8.5 miles of the Washington Mountain Brook system is first-order stream, and the remaining 3.8 miles is second-order stream. Although the concept of stream order was originated to provide a system for classifying the morphological relationship of streams in a drainage system, the concept has been applied to the study of biological cummunities inhabiting streams. Recent discussions of stream fish communities indicate that fish distributions are related to stream order (Kuehne, 1962; Lotrich, 1973).

Stream flow was measured by the "end area-velocity" method at eight stations along the Washington Mountain Brook (Figure 15). Flow measurements were made with each collection of water quality samples. Flow data collected during the survey are summarized in Table 5. Stream velocities

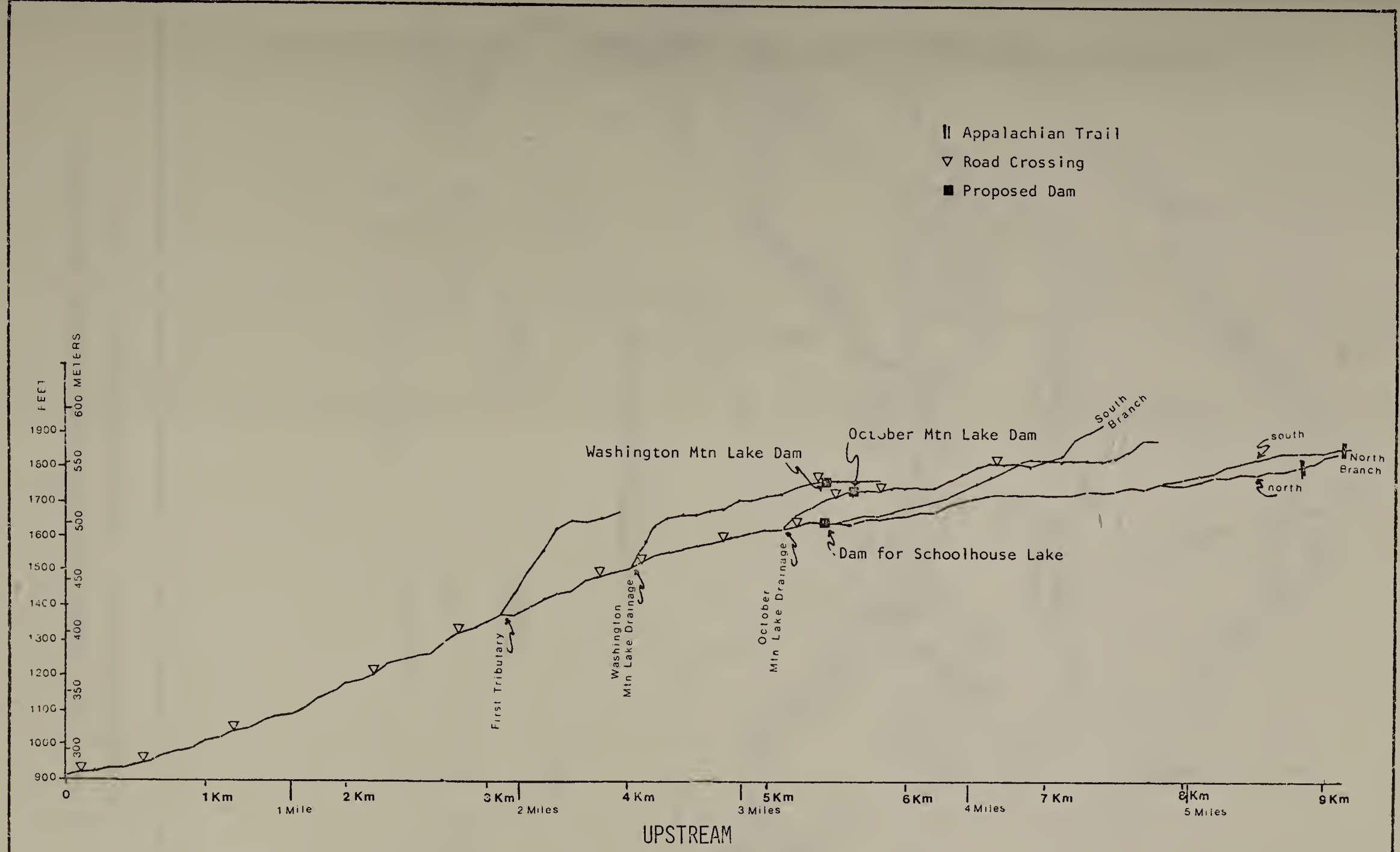


FIGURE 13. GRADIENT PROFILE OF WASHINGTON MOUNTAIN BROOK.

FIGURE 14 STREAM ORDER
WASHINGTON MOUNTAIN BROOK WATERSHED

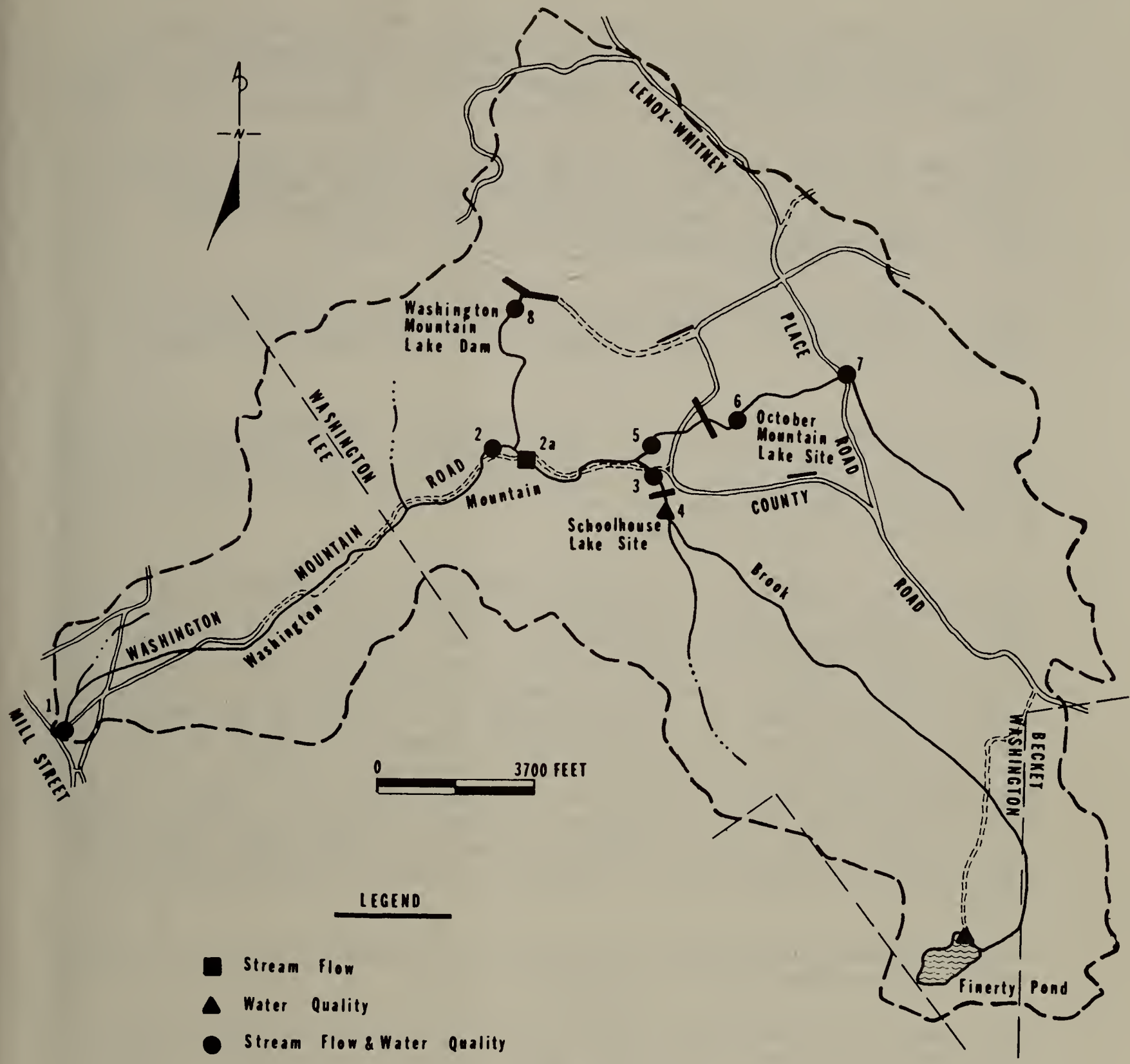


FIGURE 15 STREAM FLOW & WATER QUALITY STATIONS
WASHINGTON MOUNTAIN BROOK WATERSHED

in the brook ranged from undetectable at station 6 to 9.5 feet/second under the bridge near station 2. Flows ranged from undetectable to 28.5 cubic feet per second (cfs). During the period of the field survey (August-September 1975), high, moderate, and low flows were measured in the brook.

High flows occurred on August 14. Low flows occurred on August 21 and September 18. Station 6, which was located between two beaver ponds in Reach 8, generally had no measurable flow, even though the sound of water flowing through the upstream dam was very distinct.

During the field surveys for this assessment flow was observed in all areas of the watershed. Flows were not sufficiently low to permit an accurate differentiation between perennial, intermittent, and ephemeral reaches.

The U.S. Geological Survey in a 1968 publication[1/] estimated that the median 7-day minimum flow (annual) is 0.13 to 0.17 million gallons per day (mgd) per square mile. This would average 0.15 mgd per square mile or about 0.23 cubic feet per second per square mile (csm). The annual runoff volume is about 26 inches.

Finerty Pond is located in the town of Washington at an elevation of 1,913 feet msl. The pond is surrounded by the October Mountain State Forest. The Commonwealth of Massachusetts owns the pond, but the town of Lee, which relies on the watershed as a supplementary water supply, owns the water rights. The pond was natural, but additional storage capacity has been added by the construction of a low dam around the pond. The pond has a surface area of 25 acres and a maximum depth of 20 feet. The 0.9-mile shoreline has an intermediate slope and is wooded. The Appalachian Trail passes the pond on its eastern shoreline. Water in the pond is clear, and aquatic vegetation is scarce. McCann and Daly (undated) classified the pond as oligotrophic. The public is excluded from the pond and fishing is not permitted in an attempt to protect the emergency water supply source.

Washington Mountain Lake dam is discussed in a subsequent section entitled "Water Resource Development Projects."

Water quality was monitored at eight stations in the Washington Mountain Brook Watershed (Figure 15). Water quality data collected during these surveys are summarized in Table 6. Water quality in the brook is generally good. Dissolved oxygen concentrations are high. The lowest concentrations occur at station 6 which is in an impounded reach. Concentrations of BOD, COD, nitrate and ammonia nitrogen, ortho and total phosphorus, fecal coliforms and total coliforms are generally low. Values for pH indicate that the brook is acidic. The water is highly colored. Total dissolved and total suspended solids concentrations are generally low. Water temperatures are normally less than 20°C limit for acceptable brook trout habitat (Scarola, 1973).

1/ U.S. Geological Survey, 1968. Hydrology and Water Resources of the Housatonic River Basin, Massachusetts. USDI, U.S. Geological Survey, Washington, D.C. 20242, 4 sheets.

TABLE 5

STREAMFLOWS MEASURED IN WASHINGTON MOUNTAIN BROOK FROM AUGUST 7 TO SEPTEMBER 18, 1975. FLOWS ARE IN CUBIC FEET PER SECOND.

Date	Station 1	2	2a	3	5	6	7	8
August 7	5.8	5.1	26.4	3.7	6.8	2.3	1.0	2.8
August 14	24.9	28.5	15.7	7.4	8.3	1.2	7.3	15.5
August 21	3.5	3.5	5.6	3.7	5.3	NMF[1/]	1.1	0.6
August 28	4.4	8.2	5.3	4.6	5.9	NMF[1/]	0.2	1.7
September 4	10.9	12.9	14.1	8.4	8.3	NMF[1/]	1.5	9.1
September 11	12.5	12.5	5.7	3.1	9.7	NMF[1/]	1.0	4.6
September 18	3.6	4.9	3.3	2.7	4.8	NMF[1/]	1.7	1.0
Mean	9.4	10.8	10.9	4.8	7.0	--	2.0	5.0

1/ No measurable flow.

TABLE 6

A SUMMARY OF WATER QUALITY DATA COLLECTED FROM WASHINGTON MOUNTAIN BROOK FROM AUGUST 7 TO SEPTEMBER 18, 1975. FIGURES ARE MEAN VALUES FOR SEVEN OBSERVATIONS, EXCEPT FOR ALKALINITY AND ACIDITY WHICH ARE MEANS FOR THREE OBSERVATIONS

		Station							
		1	2	3	4	5	6	7	8
Water Temperature	(C°)	15.0	14.1	13.8	15.3	15.8	16.9	13.8	16.1
Dissolved Oxygen	(mg/l)	9.2	9.1	8.9	8.3	8.1	5.6	7.2	6.6
BOD	(mg/l)	3	1	2	1	2	2	1	2
COD	(mg/l)	21	29	26	32	34	44	33	51
Total Dissolved Solids	(mg/l)	66	34	35	28	38	35	38	50
Total Suspended Solids	(mg/l)	23	26	21	25	24	30	21	25
Turbidity	(JTU)	3	4	4	4	4	4	4	4
Color	(units)	63	103	73	71	136	148	123	194
pH (Median)		7.1	6.0	6.0	5.8	5.8	5.5	5.0	5.1
Nitrate-nitrogen	(mgN/l)	0.33	0.54	0.30	0.34	0.70	0.89	0.65	1.03
Ammonia-nitrogen	(mgN/l)	0.22	0.19	0.13	0.19	0.40	0.34	0.48	0.36
Total nitrogen	(mgN/l)	1.95	2.11	1.68	2.15	2.76	2.75	2.35	3.11
Orthophosphate	(mgP/l)	0.04	0.03	0.04	0.06	0.04	0.04	0.02	0.06
Total phosphorus	(mgP/l)	0.08	0.09	0.13	0.12	0.08	0.09	0.06	0.11
Fecal coliforms	(MPN/100ml)	528	10	8	18	31	54	33	6
Total coliforms	(MPN/100ml)	2683	433	381	393	1409	861	356	739
Acidity	(mg/l)	6	5	5	6	6	7	9	12
Alkalinity	(mg/l)	36	11	6	5	5	4	1	3

Washington Mountain Brook was not specifically mentioned in the State Water Quality Standards published on September 21, 1978. This stream must be inferred to be included in the "other surface waters" which were denoted as Class B (this is also true of Lee's primary water supply source, Codding Brook). The water quality data displayed in Table 6 for the impoundment reaches satisfy the criteria for Class A waters, with the exception of Total Coliform. This total coliform appears to be from natural sources, excluding human contributions.

Two water quality samples were collected from the surface of Finerty Pond during the environmental evaluation of the watershed. The results of these surveys (see Appendix B) support the proposition that the pond is oligotrophic. Dissolved oxygen concentrations are moderately high, and nitrogen and phosphorus concentrations are low. The water was extremely clear (average turbidity was 4.25 JTU) and no algal masses were observed. Water quality in the pond meets Class A stream standards.

Wetlands

There are about 265 acres of wetlands within the watershed which are classified as follows:

Type[1/]	Approximate Acreage
Type 1 - Seasonally Flooded	5
Type 2 - Inland Fresh Meadow	73
Type 3 - Inland Shallow Fresh Marshes	24
Type 4 - Inland Deep Fresh Marshes	9
Type 5 - Inland Open Fresh Water	15
Type 6 - Shrub Swamp	19
Type 7 - Wooded Swamp	120
Total	265

Wetlands comprise about 4.6 percent of the watershed area (see Figure 16). Further discussion is contained in the Plant and Animal Resource section.

Plant and Animal Resources

Terrestrial Communities

The composition of existing and future plant and animal communities in the Washington Mountain Brook Watershed is dependent upon the interaction of several environmental factors. Any interpretation of the quantitative data from the species present or prediction of the composition of future communities must account for these interactions. Factors which have been most important in determining existing terrestrial communities and which will continue to influence future species composition include topography, geology, climate, soils, the history of land use, and biotic influences.

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

In the Washington Mountain Brook Watershed, as elsewhere in New England, little of the pre-colonial forest survived the clearing for cultivation or the lumbering which occurred before 1850. Subsequent abandonment of farmland has permitted natural reforestation of the region (Braun, 1950).

Because of its rugged topography, the Washington Mountain Brook Watershed affords a wide range of sites suitable for a variety of plant communities. Forest and wetland types in the watershed have been identified and mapped from aerial photographs (MacConnell, 1971). Based on the ratio of coniferous to deciduous trees in the mapping areas, MacConnell classified the forest types as hardwood, hardwood-softwood, softwood-hardwood, softwood and planted stands. In addition, the height and density of each stand was indicated.

Egler (1940) studied the vegetation of the Berkshire Plateau, and divided the region into three distinctive areas. The Washington Mountain Brook Watershed is generally within his "Blandford Area." This study is of particular interest because changes in the composition of plant communities over the past 35 years can be used to predict the future of six plant communities in forecasts of the Blandford Area. Five of these communities are currently present in the Washington Mountain Brook Watershed.

Plant communities in the Washington Mountain Brook Watershed have developed a great diversity in response to variations in physical features and changes in land use. These plant communities are displayed in Figure 16.

Forest

Forest types occurring within the watershed include:

- Hardwood forest, represented by several plant communities;
- Hardwood-softwood forest, dominated by spruce or hemlock;
- Softwood forest, usually dominated by spruce; and
- Planted softwoods of spruce or pine.

Hardwood forest occupies approximately 2,968 acres (52 percent) of the watershed. Approximately 2,493 acres, or 84 percent, of the hardwood forest is developed with trees of 10 inches or more dbh (diameter at breast height 4.5 feet) forming a canopy closure of 80 percent or more. Less developed hardwood stands, either with a more open canopy or smaller tree girth or both, occupy 446 acres or about 15 percent of the hardwood forest area.

Prominent tree species in the hardwood forest include sugar maple, beech, yellow birch, gray birch, white ash, black cherry and hemlock. Other species occasionally exert a local dominance. Plant communities are named according to the dominant species. The most frequently encountered plant communities of the hardwood forest in the Washington Mountain Brook Watershed are the beech-birch-maple, the beech-hemlock, and the cherry-ash-maple. The beech-hemlock association included in the hardwood forest cover type consists of stands with less than 20 percent hemlock in the canopy.

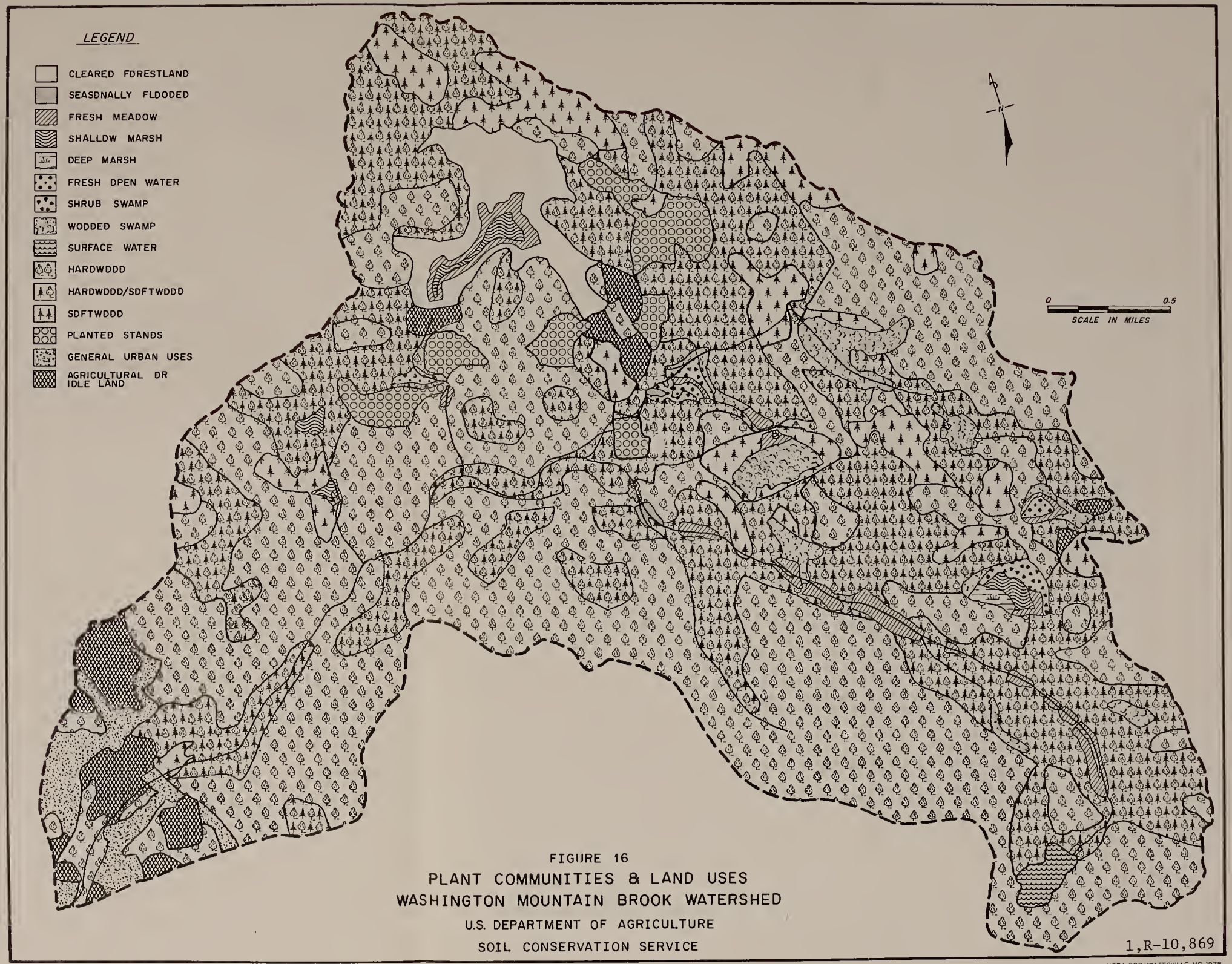


FIGURE 16

PLANT COMMUNITIES & LAND USES

WASHINGTON MOUNTAIN BROOK WATERSHED

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

1,R-10,869

USDA-SCS HYATTSVILLE, MD 1978

Some authors include all three vegetational patterns in hemlock-white pine-northern hardwood forest (Braun, 1950). However, due to successional advancement and lumbering, little white pine remains in this watershed. The three groups listed appear to be natural segregates with characteristic understory associates.

Hardwood-softwood forests, mixed deciduous-coniferous, occupy approximately 1,523 acres (26.5 percent) of the watershed.

Previous mapping of forest types in the watershed (MacConnell, 1973) distinguished between hardwood-softwood forests and softwood-hardwood forests. Mixed stands in which hardwoods constituted up to 80 percent of the trees were classified as hardwood-softwood, while mixed stands composed of up to 80 percent softwoods were mapped as the softwood-hardwood. In this study, both softwood-hardwood and hardwood-softwood forests are designated as mixed stands. Generally, mixed stands in the western sector are dominated by softwoods. The softwood component in the western sector is hemlock. In the eastern sector the softwood dominant is red spruce.

In the eastern section of the watershed, where spruce is a dominant in the mixed forest, the composition and density of the understory is different from that in the western portion. Because spruce is an invader in old field succession, mixed forests represent a more mature development. Only the most tolerant hardwood species, including beech, sugar maple and yellow birch are able to become established in the dense, shaded spruce forest. Black cherry and ash appear locally and are apparently favored by the selective cutting of spruce. Hemlock appears in the spruce forest, occupies ravines, and is randomly distributed among the spruce and hardwoods. In the eastern portion of the watershed, ravines are less often a topographic feature than elsewhere. Balsam fir occurs in the understory. It rarely achieved canopy size and the number of seedlings in the understory is remarkable because so few reach maturity.

The shrub community plays a minor role in spruce-hardwood forests. Although it is more limited in diversity than in hardwood stands, a herbaceous stratum develops. Club moss, spinulose woodfern and the violet wood sorrel are predominate. Occasionally, patches of ground dogwood are present.

Softwood forest occupies 438 acres or 7.6 percent of the land in the watershed. Naturally occurring softwood forests are dominated by hemlock or red spruce. In addition, many pockets of hemlock, too small to map, are included in mixed stands and hardwood stands.

Naturally occurring spruce stands have been invaded by hardwoods and hemlock. They generally occur in the uplands on recently abandoned crop and pasture land. Spruce is the first tree species to invade during old field succession in the Berkshire uplands. In the Washington Mountain Brook Watershed, sufficient time has elapsed for the spruce to have grown to maturity. Commonly spruce trees are of 9 to 11 inches dbh, but on some sites they have grown to 15 inches dbh. This forest community occurs as even-aged stands.

The paucity of understory and ground cover in younger spruce stands renders this vegetational cover type poor for wildlife habitat. Development of the ground cover and shrub strata is confined to scattered openings in the forest. Intermittent openings are characteristic of the spruce forest. These openings, whether caused by disease and death of a few individuals or by local soil features which have prevented establishment of trees, support a few recurring species. These species include blackberry, elderberry, wild rose, hawthorne and wild apple. In these pockets, meadowsweet, alder and willow dominate. Older spruce stands which are now being invaded by species of the northern hardwoods are more productive for wildlife utilization. The older spruce stands also include larch and balsam fir. Larch often reaches the canopy. However, fir rarely attains canopy height, although saplings and seedlings are common.

Planted softwood stands occupy approximately 136 acres or 2.4 percent of the watershed. MacConnell mapped the larger (over 3 acres) planted softwood stands of the watershed. Because several planted stands occupying less than 3 acres are scattered through the natural forests, particularly in the vicinity of the planned impoundments, the acreage of planted softwoods is probably more than 136 acres and may approach 150 acres. The small planted stands are often bordered by stone fences, which suggests agricultural use of this land before the plantations were established.

Several species were planted, but Norway spruce appears most frequently. Some stands are composed of more than one species and include white spruce, red pine, or scotch pine. White pine appears to have been planted least.

Unfortunately, these stands were not thinned, and competitive stress is evident. Many dead trees of about 6 inches dbh are present in all the stands. The successful individuals are from 9 to 12 inches dbh in most stands. Individuals, while they have achieved both girth and height, have been damaged by storms or sustained other mechanical injury resulting in crooked trunks. For this reason, many trees are poor quality timber.

Understory and ground cover are virtually lacking in the planted stands. Seeds are the only food source available to animals. Red squirrels thoroughly utilize the Norway spruce seeds. Porcupines use the bark of some species, and a few trees have been completely girdled by porcupines. This dense forest may serve as temporary shelter for some animals and birds during severe winter storms. Magnolia warblers nest in these stands during the summer. Normally this species nests in boreal coniferous forests further north.

Discontinuities in the forests have resulted from the installation of a telephone cable corridor, several roads, the borrow and disposal areas for Washington Mountain Lake dam, and the cleared land for the reservoir.

Most of the roads are too narrow to permit development of open site flora at the shoulder. However, the telephone cable corridor is sufficiently wide to permit development of an "edge vegetation." At the interface of the cleared corridor and the forest, this band of shrubby vegetation grows in response to abundant sunlight. It is diverse in species composition and includes many food plants for wildlife. Black raspberry, wild

apple, hawthorne, elderberry, wild roses, pin cherry and shadbush are abundant. In addition to food, this border offers cover and nesting sites for birds. Use of this corridor as a travel lane for deer was evidenced by tracks and pellet groups. Sparrows, robins, and warblers were frequently sighted in this edge vegetation.

Approximately 3 acres around the Washington Mountain Lake site have been restored with grasses and legumes. The emergency spillway, an area adjacent to the dam, and a disposal site opposite the Navin Road dike have been planted with creeping red fescue and other grasses and legumes. While the cover is not yet complete, this planting has been successful in preventing erosion and provides forage for wildlife. Brushy areas west of the dam and east of the disposal area at the Navin Road dike occupy approximately 7 acres. These brushy areas are cataloged as "abandoned field" in the MacConnell land use map. This designation is applied to wooded areas with less than 30 percent forest cover. Sprout hardwoods, spruce, and blackberry canes dominate the vegetative cover. Although the only animals sighted in the brushy areas were porcupines, the flora appears to provide a wildlife food and cover resource. Approximately 10 acres around the perimeter of the lake is expected to develop brushy edge vegetation in response to increased availability of sunlight.

Wetlands

Wetlands are a valuable hydrologic resource and are a significant wildlife habitat. Wetlands in the Washington Mountain Brook Watershed are classified according to the system of Shaw and Fredine (1956).[1/] This classification system was developed to delineate areas which are important to waterfowl, furbearers and game species. A nationwide inventory of wildfowl resources was based on the classification of wetlands into 20 types. Fresh Meadow (Type 2 wetland) and wooded swamp (Type 7 wetland) are the dominant wetland types in the upper watershed.

As listed on page 43, there are about 265 acres of wetland within the watershed. Following are descriptions of the wetland types and the acreage within the watershed.

Type 1 - Seasonally flooded basins or flats

The soil is covered with water, or is waterlogged, during variable seasonal periods but usually is well drained during much of the growing season. There are about 5 acres of this wetland type. This type provides all or a part of the habitat requirements of a variety of warblers, catbird, field sparrow, white-throated sparrow, common grackle, swamp sparrow, tree swallow, red-winged blackbird, meadow jumping mouse, shorttail shrew, common garter snake, and leopard frog.

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

Type 2 - Inland fresh meadows

The soil usually is without standing water during most of the growing season but is waterlogged within at least a few inches of its surface. Vegetation is primarily reed canarygrass, sedges, rushes, and meadowsweet. The majority of the 73 acres located within the watershed lies along Washington Mountain Brook, south of County Road. This type provides all or part of the habitat requirements of the mallard, American bittern, tree swallow, yellow warbler, red-winged blackbird, swamp sparrow, common grackle, red-tailed hawk, red shouldered hawk, common garter snake, eastern ribbon snake, spring peeper, leopard frog, pickerel frog, meadow vole, and meadow jumping mouse.

Type 3 - Inland shallow fresh marshes.

The soil is usually waterlogged during the growing season; often it is covered with as much as 6 inches or more of water. Vegetation includes grasses, spikerushes, arrowheads, pickerelweed, burreed, and smartweeds. This wetland type totals about 24 acres at four separate locations. This type provides all or a part of the habitat requirements of the mallard, black duck, wood duck, green heron, red shouldered hawk, killdeer, least flycatcher, tree swallow, northern waterrush, red-winged blackbird, swamp sparrow, muskrat, beaver, raccoon, mink, pickerel frog, green frog, common garter snake, and eastern ribbon snake.

Type 4 - Inland deep fresh marshes.

The soil is covered with 6 inches to 3 feet or more of water during the growing season. Vegetation includes duckweed, waterlilies, pondweeds, coontail, watermilfoil, and watershield. These areas represent about 9 acres and are largely the result of beaver activity. This type provides all or a part of the habitat requirements of the mallard, black duck, wood duck, Canada goose, green heron, tree swallow, little brown bat, muskrat, beaver, otter, mink, common newt, spotted salamander, American toad, spring peeper, leopard frog, pickerel frog, green frog, bull frog, spotted turtle, and eastern painted turtle.

Type 5 - Inland open fresh water

Shallow ponds and reservoirs are included in this type. Water is usually less than 10 feet deep and is fringed by a border of emergent vegetation. Vegetation (mainly at water depths of less than 6 feet) includes pondweeds, coontail, watermilfoils, and waterlilies. There are about 5 acres of this type present, representing three locations. This type provides all or a part of the habitat requirements of the mallard, black duck, Canada goose, wood duck, hooded merganser, tree swallow, kingfisher, beaver, muskrat, otter, common newt, green frog, bull frog, snapping turtle, spotted turtle, eastern painted turtle, and common water snake.

Type 6 - Shrub swamps

The soil is usually waterlogged during the growing season, and is often covered with as much as 6 inches of water. Vegetation includes speckled alder, willow, buttonbush, silky dogwood, sweetgale, winterberry, and meadowsweet. This type amounts to about 19 acres. This type provides all or part of the habitat requirements of a variety of warblers, catbird, field sparrow, white-throated sparrow, woodcock, cedar waxwing, kingbird, wood turtle, common garter snake, eastern ribbon snake, American toad, spring peeper, wood frog, and long-tailed weasel.

Type 7 - Wooded swamps

The soil is waterlogged at least to within a few inches of its surface during the growing season, and is often covered with as much as 1 foot of water. Vegetation includes red maple, American elm, eastern hemlock, red spruce, tamarack, and yellow birch. This is the most dominant wetland type in the watershed totaling 120 acres. This type provides all or part of the habitat requirements of a variety of warblers, blue-gray gnatcatcher, wood duck, black duck, red-shouldered hawk, hairy woodpecker, phoebe, tree swallow, red-eyed vireo, white-breasted nuthatch, tufted titmouse, masked shrew, smoky shrew, shorttailed shrew, raccoon, red squirrel, white-tailed deer, porcupine, common garter snake, eastern ribbon snake, wood frog, common newt, spring peeper, and wood turtle.

Specific Sites

Impoundment and accessory sites were studied in detail to estimate the impact of the proposed structures and reservoirs upon the availability of wildlife habitat in the watershed.

October Mountain Lake, dam, spillway, dike, disposal areas and waterway will require approximately 112 acres of land which supports vegetation or is presently cleared. Vegetative cover at the site is delineated in Figure 17 and quantitative area data are provided in Table 7.

Hardwood forest occupies approximately 11 percent of the cover. Prior to 1976 this cherry-ash-maple community consisted of medium to large sawlog size timber with ash up to 15 inches dbh, black cherry to 18 inches dbh, and sugar maple up to 16 inches dbh. In 1976 all merchantable timber was harvested from the lake site in preparation for future construction. Vegetation present on the site formerly occupied by the hardwood woodland now consists primarily of sapling and pole size ash, sugar maple, and black cherry, gray and yellow birch, and eastern hemlock. Understory and ground cover are of high density as a result of removing most of the forest canopy. Blackberry, ash and red maple stump sprouts and seedlings, grasses and other seedlings have rapidly grown or invaded the area creating a high density understory.

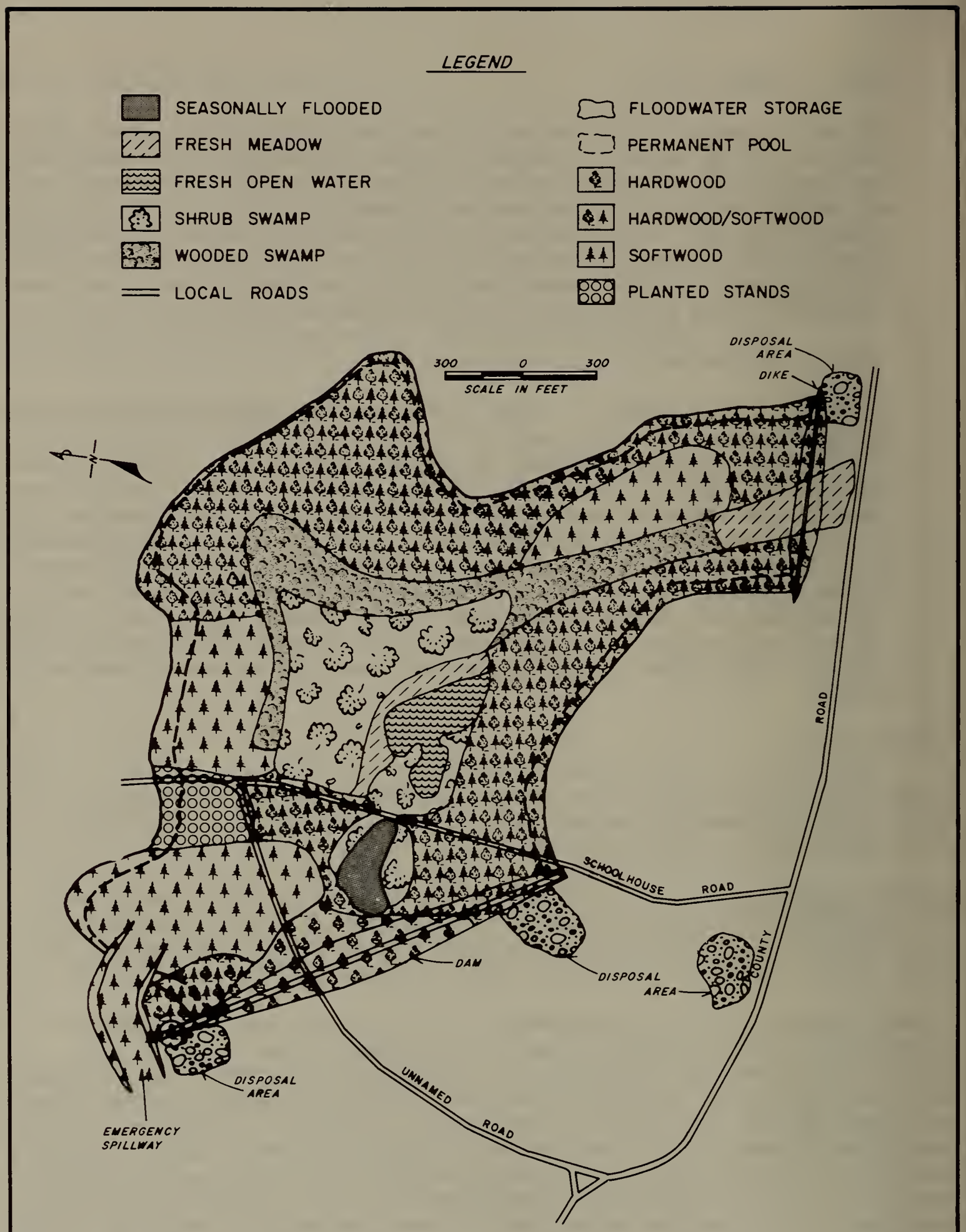


FIGURE 17

VEGETATIVE COVER AT THE OCTOBER MOUNTAIN LAKE SITE

WASHINGTON MOUNTAIN BROOK WATERSHED

TABLE 7

PRESENT VEGETATIVE COVER OF THE OCTOBER MOUNTAIN LAKE SITE TO BE LOST

Cover Type	Acres	Community	Overstory Associates	Maximum dbh	Average dbh (Canopy)	Understory Dominants	Density	Groundcover Dominants	Density	Woodland Wildlife Habitat Rating
Hardwood Forest	12	Cherry-Ash-Maple	Beech, Birch, Hemlock, Spruce	22"	12"	Shadbush, witch hazel, viburnums, striped maple, dogwood, saplings of the canopy species.	Moderate	Wood fern, bead fern, club moss, yew, twinberry, wood sorrel, mountain aster, moss.	Moderate	Fair to Good
Mixed Hardwood-Softwood	53	Spruce-Hardwood	Maple, Cherry, Birch, Hemlock, Ash	20	11	Canopy saplings, fir saplings, viburnums, witch hazel	Sparse	Bead fern, wood fern, hay-scented fern, club moss, ground dogwood, gold thread	Sparse	Poor to Fair
Softwood Forest	9	Spruce	Larch, Maple, Hemlock, Ash	16	9	Saplings of spruce, fir, maple, cherry, viburnums.	Sparse	Ferns, club moss, blue bead lily, ground dogwood, wood sorrel	Very sparse	Poor
	7	Planted Stands	Spruce	12	8	None	-	None	-	Very Poor
Sub-total	81									

	Acres	Woody Plants	Herbaceous Plants
Seasonally Flooded (Type 1)	2	Speckled alder, spirea	Goldenrod, sedges
Fresh Meadow (Type 2)	2	Scattered meadowsweet	Reed canarygrass, sedges, rushes
Open Fresh Water (Type 5)	5	--	Pond weeds, coontail, milfoil, waterlilies
Shrub Swamp (Type 6)	8	Willow, speckled alder, sweetgale, meadowsweet	Bone set, joe-pye-weed, cattails, sedges
Wooded Swamp (Type 7)	8	Red maple, green ash, red spruce	Sphagnum moss
Subtotal	25		
TOTAL	106		

Approximately 50 percent of the lake site consisted of mixed hardwood-softwood stands. Red maple, black cherry, eastern hemlock, white ash, and red spruce were the most common species. Harvestable timber has been removed and understory plants and stump sprouts are rapidly filling in the space left by tree removal. Understory varies from moderate to dense at the present time.

Natural stands of softwoods occupy about 8 percent of the area required for installing the October Mountain Lake. Prior to harvest these stands were primarily red spruce with an occasional tamarack, red maple, eastern hemlock, ash, and bigtooth aspen. These stands were harvested and the understory is increasing in density although at a slower rate than the hardwood or mixed hardwood-softwood stands that were harvested. Blackberry is a particularly common site invader where the softwood stands were harvested. Since much of the red spruce in these stands was too small to be merchantable there still remains a substantial amount of red spruce less than 9 inches dbh.

Planted softwood stands consist primarily of Norway spruce and occupy about 8 percent of the site area. Blackberry is a common invader where these stands occurred. Trees less than 9 inches dbh were not harvested.

Shrub swamp and wooded swamp occupy the largest percentage of wetland cover at this site. Red maple, green ash and red spruce dominate the wooded swamp. The shrub swamp is dominated by several species of willow and alder. Sweetgale and spirea occur frequently. Herbaceous plants include boneset and joe-pye-weed. Cattails, grasses and sedges cover some locally elevated hummucks. Sphagnum moss is common in the wooded swamp. Beavers had not occupied the site area in 1975 but are now active at the site and have restored 5 acres of open beaver flowage.

Schoolhouse Lake will have a surface area of approximately 39 acres. The flood control pool delineation encloses an additional 16 acres. The vegetative cover which is present on these sites is delineated in Figure 18 and quantitative area data is provided in Table 8.

The wetland types in the area designated for the recreational pool are seasonally flooded flats, fresh meadow, and shallow marsh. Nearly all of these wetlands are the result of previously active beaver flowages.

The fresh meadow vegetation is primarily reed canarygrass, sedges, rushes, and meadowsweet.

Shallow marsh at this site is less than one-half acre and occurs immediately upstream of a decadent, breached beaver dam.

Wildlife signs in addition to those of raccoons and muskrats at the edge of the shrub swamp, included deer tracks and woodchuck burrows. Red squirrels and many song birds were observed. Mallards utilize the shallow marsh.

In 1976 the merchantable timber was harvested from the forested acreage of the Schoolhouse Lake site in preparation for future construction.

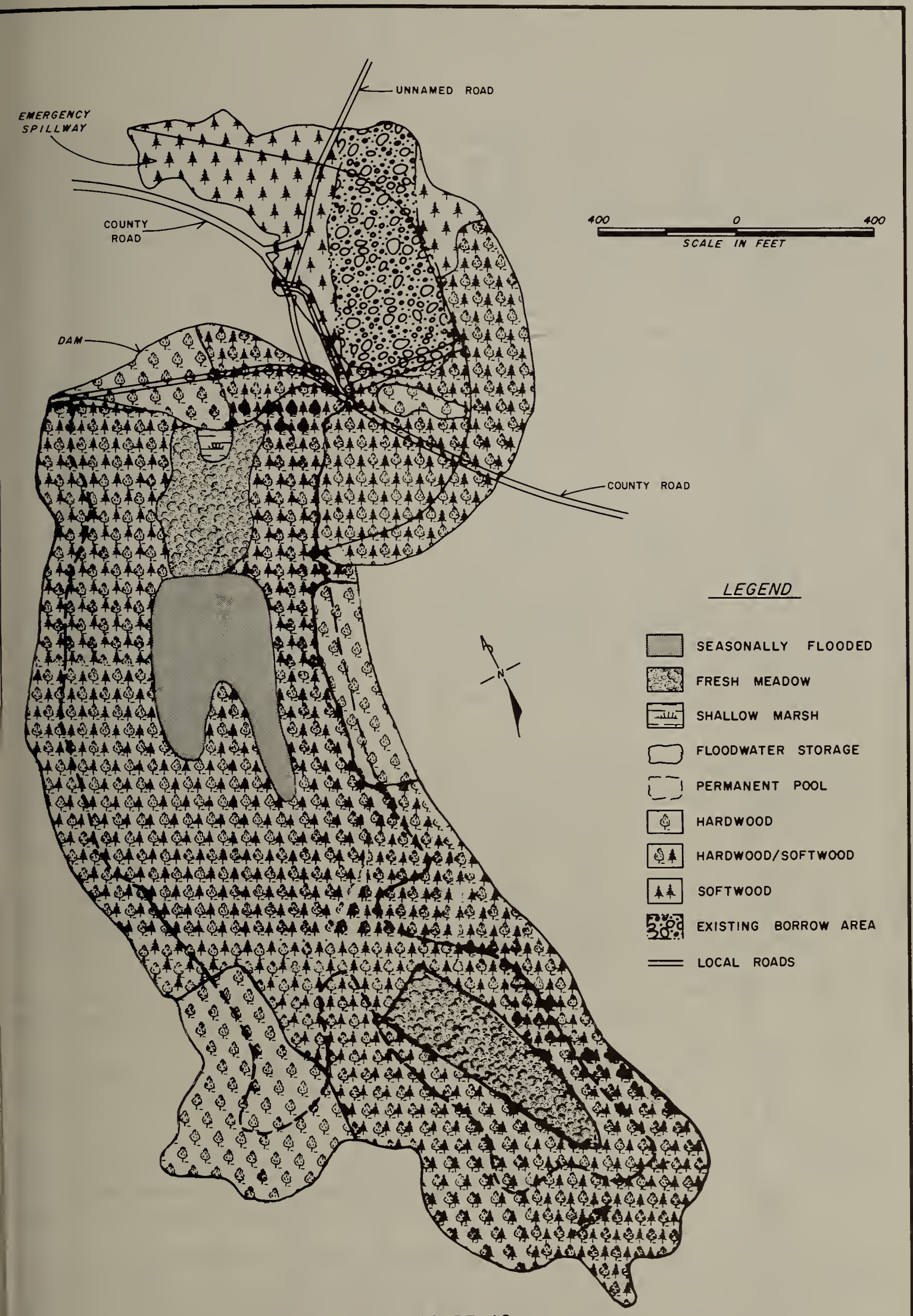


FIGURE 18

VEGETATIVE COVER AT THE SCHOOLHOUSE LAKE SITE

WASHINGTON MOUNTAIN BROOK WATERSHED

TABLE 8

PRESENT VEGETATIVE COVER OF THE SCHOOLHOUSE LAKE SITE TO BE LOST

Cover Type	Acres	Community	Overstory Associates	Maximum dbh	Average dbh Canopy	Understory Dominants	Density	Groundcover Dominants	Density	Woodland Wildlife Habitat Rating
Hardwood Forest	4	Cherry-Ash-Maple	Hemlock, Birch	19	12	Hazelnut, Arrowwood, Mountain maple, Striped maple	Moderate	Ferns	Moderate	Fair to Good
Mixed Hardwood-Softwood	37	Spruce, Northern Hardwoods	Maple, Hemlock, Birch, Cherry, Larch	18	11	Viburnums, wild apple, hazelnut, alder, willow	Moderate	Yew, Ferns	Moderate	Fair
Softwood	7	Spruce or Hemlock	Northern Hardwoods	14	8	Saplings of northern hardwoods	Sparse	Ferns	Sparse	Poor
Existing Borrow Area --	4	Bare ground - No substantial vegetation								
Sub-total	52									

	Acres	Woody Plants	Herbaceous Plants
Seasonally Flooded (Type 1)	3	Red maple, seedlings and saplings	Goldenrod, sedges
Fresh Meadow (Type 2)	6	--	Reed canarygrass, sedges, rushes
Shallow Marsh (Type 3)	1/	--	Yellow pond lily, arrowhead
Subtotal	9		
TOTAL	61		

1/ Less than 1/2 acre.

Hardwood woodland formerly occupied 6 percent of this site and consisted primarily of black cherry, white ash, and red and sugar maples. Vegetation presently on the site consists of sapling and pole size cherry, ash, red maple, sugar maple, eastern hemlock, yellow birch, and understory plants. Understory and ground cover is of moderate to high density as a result of removing most of the forest canopy. Stump sprouting and invasion of hazelnut, blackberry, goldenrod and various grasses is occurring at a rapid rate.

Mixed hardwood-softwood forest occupies about 66 percent of the Schoolhouse Lake site. Prior to timber harvest the stands consisted of pole to large sawtimber size red spruce, red maple, aspen, eastern hemlock, yellow birch, sugar maple, black cherry, white ash, and American beech. Woody vegetation presently on the site is primarily sapling and pole size cherry, ash, sugar maple, yellow birch, hemlock, beech, aspen and red spruce. Larger trees of these species which remain are those with poor form or quality which were of little to no commercial value. Blackberry, red maple and sugar maple stump sprouts, hazelnut, arrowwood, and herbaceous plants are increasing in density in response to removal of most of the tree canopy.

Natural softwood stands occupied about 6 percent of the site. These stands consisted primarily of red spruce and eastern hemlock with an occasional yellow birch, sugar maple, white ash, and red maple. These stands were harvested in 1976. Trees less than 9 inches dbh were left remaining due to their low commercial value. Blackberry is the most common invader in these harvested softwood stands.

Washington Mountain Lake will have a surface area of approximately 224 acres. Clearing of this pool area was completed in November 1976, which resulted in 193 acres of cleared forest land and 31 acres of wetland (fresh meadow and shallow marsh), see Figure 16.

The clearing specifications required that stumps not extend more than 12 inches above ground where the depth of water is to exceed 3 feet, and no more than 4 inches where the depth of water will be less than 3 feet.

The 11-acres of shallow marsh (Type 3 Wetland) supports pondweeds, various sedges and rushes, pickerelweed, arrowhead and duckweed.

Fresh meadow (Type 2 Wetland) comprises 20 acres of the area. Principal plants are reed canarygrass and various sedges and rushes.

Woody plants including sweet gale, shrub willows, meadowsweet, silky dogwood and shrubby cinquefoil are gradually increasing in density throughout the wetland area. Plant succession to shrub swamp (Type 6 Wetland) is typical of shallow freshwater wetlands in Massachusetts.

Accessory sites near the impoundments have been designated as borrow or disposal areas. The Triangle Borrow Area, west of the dam site of October Mountain Lake dam was used for fill for the construction of Washington Mountain Lake dam. This 4-acre site has not been restored since additional fill is planned for removal for the construction of October Mountain and Schoolhouse Lake structures. A site south of the Triangle Borrow Area has

been selected for the excavation of additional construction material, from which 10 to 15 acres of hardwood-softwood forest may be removed. Additional land may be involved in grading to restore the borrow sites. Most of the softwood trees in this region are spruce of less than 10 inches dbh. The hardwoods include some excellent specimens of cherry averaging 15 inches dbh.

Wildlife Present

Wildlife present in any watershed is dependent upon the availability of diverse habitats provided by the various vegetative cover types. Most wildlife species have specialized habitat requirements which restrict their distribution. These habitat requirements are complex. Generally, food, cover, nesting sites, and water must be available within the daily range of individuals of the population. For predaceous species the food requirement is an animal whose habitat requirements must also be met. Within the watershed, the diversity of vegetative cover types, topography and other factors permit habitation by many animal species. Table 9 lists the birds found in the watershed and Table 10 lists the mammals, reptiles and amphibians found in the watershed. There are no threatened or endangered species of plants or animals recorded in the watershed (see Appendix B).

Aquatic Communities

The composition of current and future aquatic communities in the Washington Mountain Brook system is dependent upon such factors as the availability and acceptability of habitat, hydrologic relations, water quality, biotic interactions, and stocking programs. Factors which appear to be most important in determining existing aquatic communities and which will continue to influence future species composition of the fisheries in the brook include elevation and stream order.

Benthic communities of Washington Mountain Brook were sampled at six stations along the length of the stream. In order to facilitate sampling and data interpretation, the samples were obtained concurrently with the fish collections. Samples were collected at the locations shown in Figure 19 during the period from August 27-29, 1975. Two replicate Surber samples (1 sq. ft.) were sorted and identified from each station except 8a, where a Peterson grab (213 cm^2) was used. Detailed information on sampling procedures is given in Appendix B.

The collections yielded 55 identifiable genera in 13 orders of four phyla. Complete results from the survey are presented in Appendix B, Tables B-1 thru B-3. The collections were dominated by aquatic insect larvae of the orders Plecoptera (stoneflies), Ephemeroptera (mayflies), Trichoptera (caddisflies), Coleoptera (beetles), and Diptera (true flies). The genera identified and their taxonomic associations are provided in Table B-1. Table B-2 presents the results for each sample. These data were used to calculate relative abundances for each major group by station (Table B-3).

As can be seen from Tables B-1 thru B-3, an abundant and diverse fauna was collected from the stream. Goodnight (1973) has discussed the problems

TABLE 9

BIRDS FOUND IN THE WATERSHED

American Bittern
Canada Goose
Mallard
Black Duck
Green-winged Teal
Wood Duck
Green Heron
Turkey Vulture
Red-shouldered Hawk
Broadwinged Hawk
Ruffed Grouse
Killdeer
Mourning Dove
Common Flicker
Pileated Woodpecker
Yellow-bellied Sapsucker
Hairy Woodpecker
Downy Woodpecker
Eastern Kingbird
Crested Flycatcher
Phoebe
Least Flycatcher
Wood Pewee
Olive-sided Flycatcher
Tree Swallow
Barn Swallow
Ruby-throated Hummingbird
Song Sparrow
Black-throated Green Warbler
Blackburnian Warbler
Chestnut-sided Warbler
Ovenbird
Northern Waterthrush
Yellowthroat
Canada Warbler
American Redstart
House Sparrow
Red-winged Blackbird
Common Grackle
Brown-headed Cowbird
Blue Jay
Common Crow
Black-capped Chickadee
White-breasted Nuthatch
Red-breasted Nuthatch
Brown Creeper
House Wren
Winter Wren
Catbird
Brown Thrasher
Robin
Wood Thrush
Hermit Thrush
Swainson's Thrush
Veery
Eastern Bluebird
Blue-gray Gnatcatcher
Golden-crowned Kinglet
Cedar Waxwing
Starling
Solitary Vireo
Red-eyed Vireo
Black and White Warbler
Magnolia Warbler
Black-throated Blue Warbler
Yellow-rumped Warbler
Northern Oriole
Scarlet Tanager
Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Purple Finch
Goldfinch
Towhee
Dark-eyed Junco
Chipping Sparrow
Field Sparrow
Swamp Sparrow
White-throated Sparrow

TABLE 10

MAMMALS, AMPHIBIANS AND REPTILES FOUND IN THE WATERSHED

MAMMALS

Opossum	Red Bat
Masked Shrew	Raccoon
Smokey Shrew	Red Fox
Shorttailed Shrew	Gray Fox
Starnose Mole	Woodchuck
Hairytail Mole	Eastern Chipmunk
Little Brown Myotis	Eastern Gray Squirrel
Keen Myotis	Red Squirrel
Silver-haired Bat	Northern Flying Squirrel
Eastern Pipistrel	Beaver
Big Brown Bat	Deer Mouse
White-footed Mouse	Snowshoe Hare
Meadow Vole	Eastern Cottontail
Redbacked Vole	White-tailed Deer
Pine Vole	Weasel
Muskrat	Mink
Meadow Jumping Mouse	Otter
Porcupine	

AMPHIBIANS

Red Spotted Salamander	Spring Peeper
Spotted Salamander	Common Tree Toad
Dusky Salamander	Pickerel Frog
Red-backed Salamander	Northern Leopard Frog
Northern Spring Salamander	Green Frog
Northern two-lined Salamander	Wood Frog
American Toad	Bull Frog
Fowler's Toad	

REPTILES

Snapping Turtle	Northern Brown Snake
Wood Turtle	Northern Water Snake
Spotted Turtle	Eastern Ribbon Snake
Stink Pot Turtle	Ringnecked Snake
Eastern Painted Turtle	Eastern Smooth Green Snake
Box Turtle	Eastern Milk Snake
Red Bellied Snake	Common Garter Snake

of using indicator organisms as opposed to various community measures as a reflection of water quality. He concluded that no single group of organisms could be used to indicate water quality and that some measure of community structure was more useful. He described several simplified community indices which he felt were valuable, but avoided all discussion of more complex measures of diversity. Many authors have related decreases in diversity to environmental stress, and have used a wide variety of mathematical expressions. Pielou (1975) listed the attributes that an effective measure of diversity should have, and concluded that only one function has these properties, the Shannon-Wiener Index. This index has been in wide use by ecologists since its proposal in 1949. Diversity is, however, merely a single descriptive statistic and should be coupled with other measures of community structure (Pielou, 1975).

The Shannon-Wiener diversity (H') and J (the ratio of H' to H_{MAX}) were completed for each collection from Washington Mountain Brook. Station 8a is omitted from the following discussion since no animals were collected there. There was no change in diversity between stations, and values of J indicate relatively high diversity at all stations. Species richness at the stations varied from 21 to 31 species, indicative of good water quality. Allan (1975) found similar numbers of species in his study of a mountain stream in Colorado. These data indicate that the Washington Mountain Brook is not subjected to water quality degradation.

The results of the present survey indicate a shift in species along the stream course, but not in species richness. Mayflies, stoneflies and Chironomids prefer the lower reaches of the stream while simulid larvae and Simsonia larvae occur only in restricted areas. Blackfly larvae might be responding to the absence of fish predation at station 8, but the reason for the concentration of Simsonia larvae at station 2 and 5 is unknown. The caddisfly larvae were dominated by Chimarra sp. and Hydropsyche sp., which were most abundant at stations 5 and 8, but which were also common at several other stations. Changes in species abundance with altitude are common in mountain streams, but are normally accompanied by a reduction in species richness (Allan, 1975). No change in species richness was noted in this study, perhaps because of the limited altitude change = 900 ft.). In the fish collections, populations appeared to be reacting to stream order, but the benthic data do not show the same pattern. Stations 8, 8a and 5 were all in first order streams, but supported highly dissimilar benthic fauna. The differences at station 8a are related to obvious habitat differences, but there were no obvious differences between stations 8 and 5. Stations 1, 1a, 2 and 3 all were in second order reaches, but again the benthic fauna varied greatly (Table B-3).

Station 8a was the only station located in a ponded area of the stream. The bottom type was sandy silt, as opposed to stones and gravel in the other areas. It was typical of the marshy ponds found in the upper areas of the watershed. No organisms were found in the grab samples from this area, although a large variety of odonates, aquatic Coleoptera, and aquatic Hemiptera were observed. No indications of degraded environmental conditions were observed.

Fish communities were surveyed from August 25-29, 1975. All stations except 8a, were sampled using portable electrofishing equipment supplied by Coffelt Electronics, Inc. of Englewood, Colorado. Station 8a was sampled with a 20-foot hand seine with 1/4 x 1/4 inch mesh. Station locations are also presented in Figure 19.

During the survey, 582 fishes, representing nine species, were captured and released in Washington Mountain Brook (Table 11). Both the number of species and the number of individuals generally decreased with distance upstream from the confluence with the Housatonic River and with elevation (Figure 20). The exceptions to this trend were increasing numbers of banded killifish and creek chubs (Semotilus atromaculatus). Except for one individual, the banded killifish was restricted to a beaver pond (station 8a).

The large number of species present at station 1 is a result of the station's proximity to the Housatonic River. The white sucker (Catostomus commersoni), and the brown trout (Salmo trutta) appeared at no other stations and probably entered the brook to feed, take refuge and/or spawn. In addition, the numbers of slimy sculpins (Cottus cognatus), blacknose dace (Rhinichthys atratulus) and longnose dace (R. cataractae) generally decreased with distance upstream. Although the number of brook trout at station 1a exceeded the number at station 1, the decrease in the number of fish upstream from station 1a indicated that this species also preferred the lower reaches of the brook. The low number of brook trout at station 1 may have resulted from fishing pressure (station 1 is easily accessible) or competition. The Massachusetts Division of Fisheries and Wildlife annually stocks the lower reaches of Washington Mountain Brook with about 300 6- to 9-inch brook trout.

The two most important factors controlling fish distributions in Washington Mountain Brook appear to be elevation, which in this case is equivalent to distance upstream from the Housatonic River, and stream order. The effect of increasing elevation has been discussed in the preceding paragraphs. Lotrich (1973) demonstrated that the number of fish species decreased with stream order in a Kentucky stream system. The data from Washington Mountain Brook generally support the stream order concept. Only four species of fishes were collected in first order streams, and only two species, creek chubs and banded killifish, were present in substantial numbers in first order segments. All other species were restricted to second order segments. Hocutt and Stauffer (1975) found creek chubs, longnose dace, blacknose dace, and white suckers in their first order segments. Lotrich (1973) found only the creek chub in his first order streams. Lotrich also found that in some first order streams no fish occurred at anytime. This observation is similar to the result of the survey at station 8 in Washington Mountain Brook. From Lotrich's station description, first order stations in Kentucky and Massachusetts are similar. In both cases, the streams are covered by a dense canopy of trees. Lotrich proposed that direct fall leaves and associated litter should provide significant quantities of food for surface feeders, such as, the creek chub. Food would not limit fish at station 8 in Washington Mountain Brook because the benthic community is prolific and diverse. Lotrich proposed that headwater first order streams may represent the limit of physical conditions which fish can tolerate. This would appear to be true at station 8 in Washington Mountain Brook.

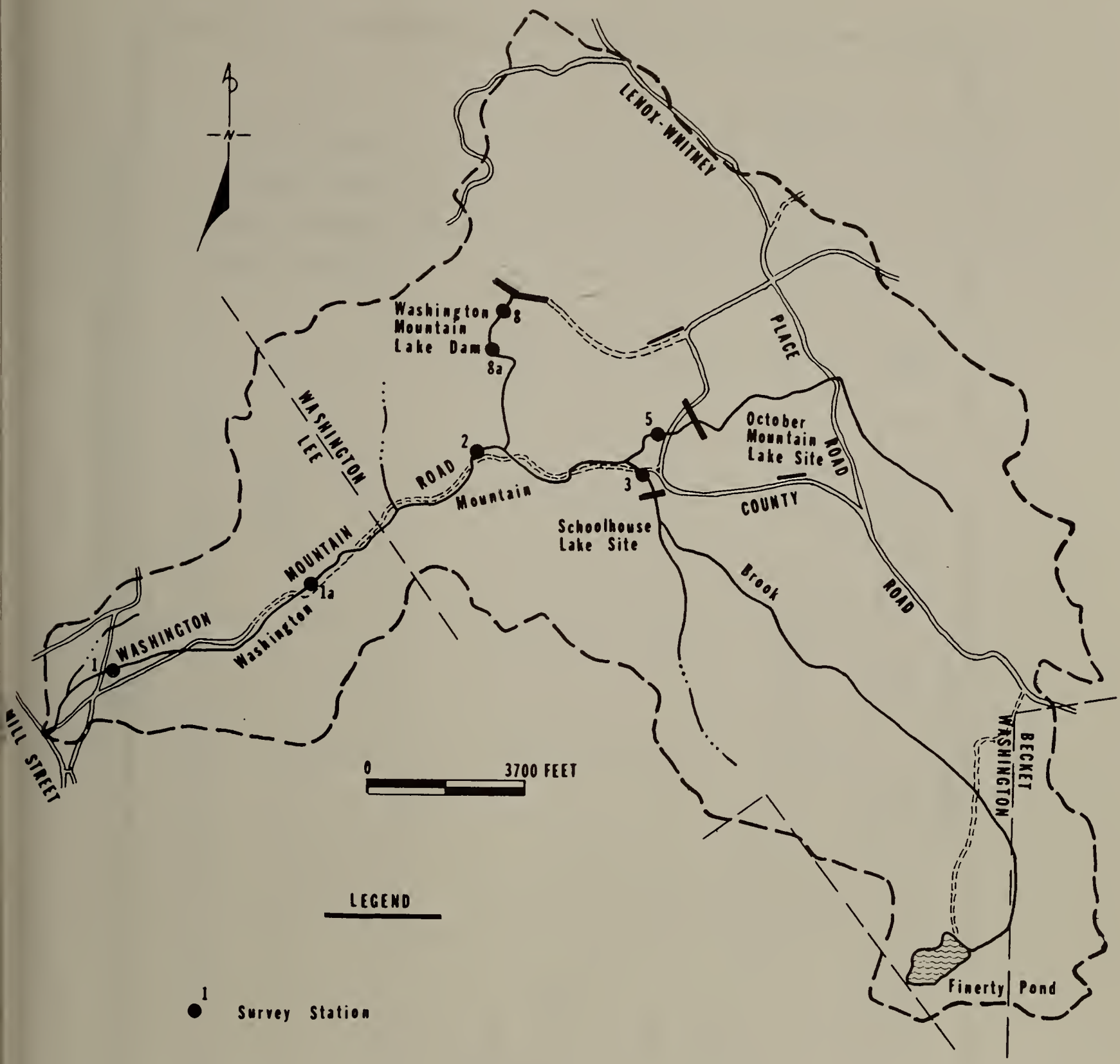


FIGURE 19 BENTHIC AND FISH SURVEY STATIONS
WASHINGTON MOUNTAIN BROOK WATERSHED

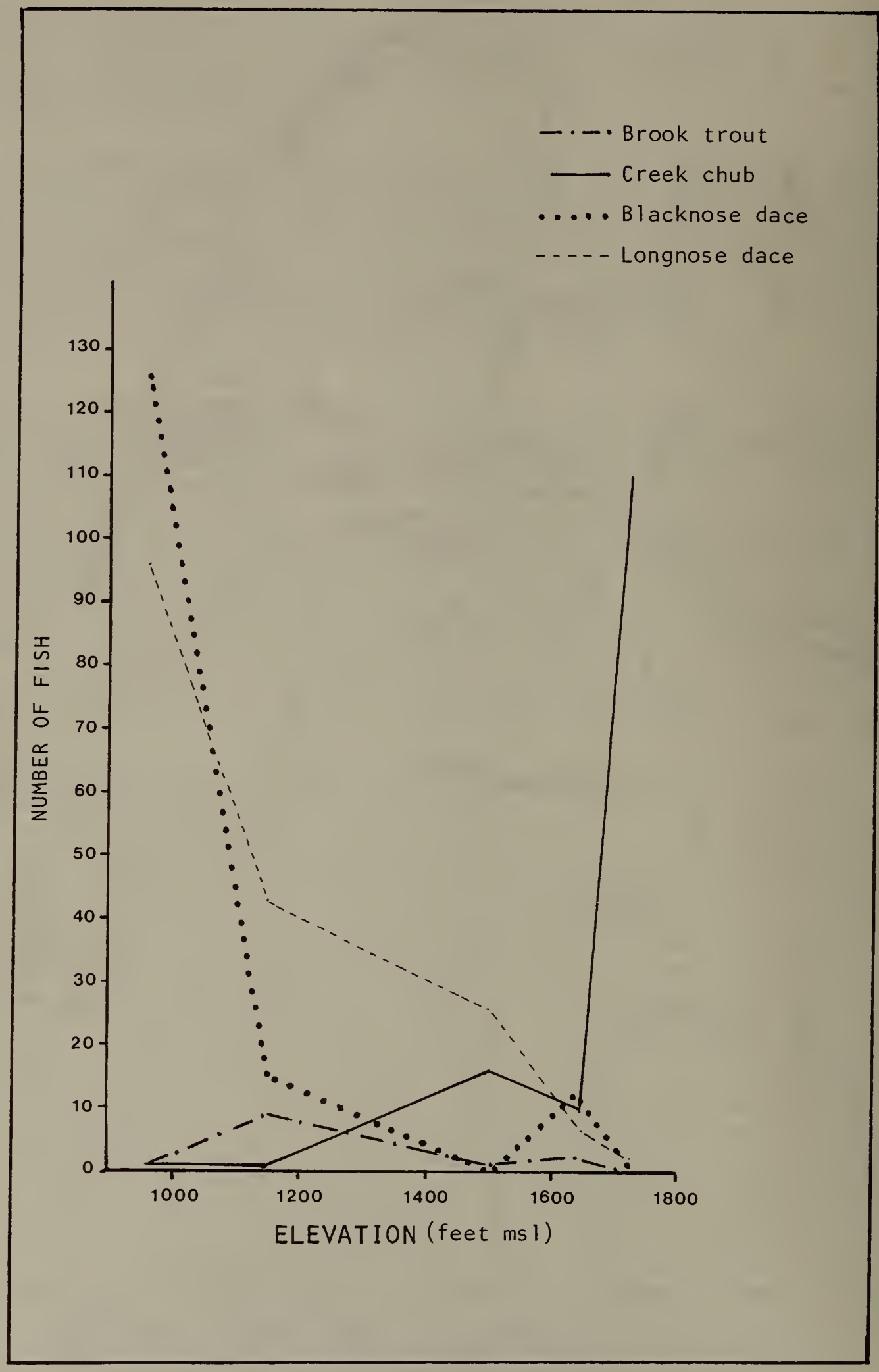


FIGURE 20 FISH DISTRIBUTION
WASHINGTON MOUNTAIN BROOK WATERSHED

TABLE 11

FISHES CAPTURED IN THE WASHINGTON MOUNTAIN BROOK, AUGUST 25-29, 1975.

Fish	Station						
	1	1a	2	3	5	8	8a
Brook trout *Salvelinus fontinalis*	1	9	1	2	0	0	0
Brown trout *Salmo trutta*	7	0	0	0	0	0	0
White sucker *Catostomus commersoni*	2	0	0	0	0	0	0
Creek chub *Semotilus atromaculatus*	1	1	16	10	110	0	0
Slimy sculpin *Cottus cognatus*	32	16	1	0	0	0	0
Blacknose dace *Rhinichthys atratulus*	125	15	0	12	1	0	0
Longnose dace *Rhinichthys cataractae*	96	43	26	7	2	0	0
Brown bullhead *Ictalurus nebulosus*	0	0	1	2	0	0	0
Banded killifish *Fundulus diaphanus*	0	0	1	0	0	0	42
TOTAL	264	84	46	33	113	0	42

Social and Economic Resources

The social and economic base of the immediate vicinity and the peripheral area of the watershed will determine the future recreational use of the area and the flood control and water supply benefits of the proposed project.

Population

Approximately 200 permanent residents live in the watershed. This population is concentrated in the lower portions of the watershed near the Housatonic River. Population characteristics of Berkshire County and the three towns included in the Washington Mountain Brook Watershed are summarized in Table 12, according to the 1975 State Census. These statistics represent a net decrease of 0.9 percent in the Berkshire County total population between 1970 and 1975.

According to the Berkshire County Regional Planning Commission (1976), the permanent population of the Upper Housatonic River 208 Planning Area will be 91,480 in 1990 and 93,280 in the year 2000. At the same time the population of seasonal residents will increase from the 1975 level of 15,139 to 16,393 in 1990 and 17,100 in 2000. The permanent population of the town of Lee will increase to 6,840 in 1990 and to 7,160 in 2000. During the same period the seasonal resident population will increase from the 1975 level of 1,671 to 1,778 in 1990 and to 1,862 in 2000.

It is estimated that more than 2 million people live within 35 miles of the watershed. The city of Pittsfield is approximately 6 miles north-northwest of the watershed. A number of large cities are within 50 miles of the watershed and include Schenectady, Troy, and Albany, New York; Bristol and Hartford, Connecticut; and Northampton, Springfield, Chicopee, and Holyoke, Massachusetts. Boston is 105 miles east of the watershed and New York City is 130 miles to the south-southwest.

TABLE 12

1975 POPULATION CHARACTERISTICS OF BERKSHIRE COUNTY AND THE TOWNS OF LEE, WASHINGTON AND BECKET

	1975 Population	Area (Sq. Mile)	Density (Persons/ Sq. Mile)
Berkshire County	148,069	947	156
Town of Lee	6,319	27	234
Town of Washington	486	39	12
Town of Becket	1,153	48	24

Economy

The economy of Berkshire County has developed into a diversified and relatively stable structure. In the course of its evolution, dependence upon agriculture has decreased, while manufacturing, trade and service industries have increased. The principal sectors of the economy which employ the largest number of people are the manufacture of electrical machines, wholesale and retail sales, services, and government. The principal industries in the town of Lee are listed in Table 13.

TABLE 13

PRINCIPAL INDUSTRIES IN THE TOWN OF LEE, MASSACHUSETTS, [SOURCE: BCRPC (1969)].

Industry	Employees	Product or Process
Appalachian Press	10	Printing
Clark-Aiken Company	150	Machinery
Hurlburt Papers, Mead Corp.	235	Paper
Lee Lime Corporation	60	Lime
Peter J. Schweitzer Kimberly-Clark Corp.	655	Paper
Westfield River Paper Co.	40	Paper

According to the Berkshire County Development Commission (BCDC) (1973), during 1967 total retail sales in Berkshire County were $248 million. In the same year, total retail sales in the town of Lee were $10.9 million. Retail sales in the town of Lee in business which would be patronized by tourists (hardware, food, apparel, gasoline, and general merchandise) were $7.0 million. Revenues from restaurants, motels and hotels are not included in this figure. Based upon the ratio of retail sales in the town of Lee to those in Berkshire County, revenues from these sources probably approach $0.8 million. Based upon the number of summer residents to the town of Lee (1,260 in 1970), revenues from tourism are approximately 9 percent of total retail sales.

A variety of land uses occur within the Washington Mountain Brook Watershed. Approximately 90 percent (5,150 acres) of the watershed is included in the October Mountain State Forest (Figure 21). The state forest is administered by the Massachusetts Department of Environmental Management, Division of Forests and Parks. No federally-owned property is located within the watershed. Approximately 88 percent of the watershed is forested, but less than 5 percent of this land is privately owned. The land uses are delineated in Figure 16 and include medium density residential, pasture, public land, abandoned field, tillable land (used and unused), and a power line corridor. A small area of low density urban development is located in the town of Lee near the confluence of Washington Mountain Brook and the

Housatonic River. The development consists primarily of detached single family residences and two small mobile home developments. Small portions of the urban land are used for sand and gravel extraction, landfill of solid wastes and utilities. Wetlands, including flood plains, marshes, and open bodies of water are located throughout the watershed but are concentrated in the middle and upper sections.

Other land uses comprising only small areas include two open areas adjacent to West Branch Road, a small cemetery, the October Mountain campground, the Appalachian Trail, and paved and unimproved roads.

Access

Transportation to the area is provided by a system of relatively good roads. Route 7, a north-south highway, and Route 20 and the Massachusetts Turnpike, east-west highway intersect near the watershed. The town of Lee is served by bus and rail lines. Two large airports, one at Hartford, Connecticut and one at Albany, New York, are located within 50 miles of the watershed. Transportation to the watershed from these airports can be made in approximately one hour. There is also an airport at Pittsfield, Massachusetts that will accommodate aircraft up to and including small executive jets.

Access to the watershed is provided by the Washington Mountain Road from Lee, the Lenox-Whitney Place Road and West Branch Road from Washington and Lower Tower Road which originates in Lenox and intersects the Lenox-Whitney Place Road north of Washington Mountain Lake. An unimproved road from Becket Road provides partial access to the southern portion of the watershed and to Finerty Pond. Access by hiking is also provided by the Appalachian Trail. Roads within the watershed total approximately 13 miles and are generally unimproved. Approximately 1 mile upstream from the Housatonic River the Washington Mountain Road becomes impassable. Upstream of this point the road has been narrowed to the width of a footpath. Several wooden bridges have been destroyed or damaged. Other roads in the watershed are badly eroded and some impassable by vehicle.

Recreational Resources

The Washington Mountain Brook Watershed supports a variety of recreational activities related to both the natural resource base and man-made facilities. Available activities include fishing, hiking, snowmobiling, camping, and hunting. The State of Massachusetts operates a 50-unit campground in Lee near the outlet of the watershed. Detail use data are not available for many of the recreational activities in the watershed. However, available data was compiled and reviewed and then supplemented through communications with personnel from local, state and federal agencies. This section contains a brief description of each of the existing recreational facilities and an analysis of the existing and potential use that could be made of each existing facility. The locations of these facilities are depicted in Figure 21.

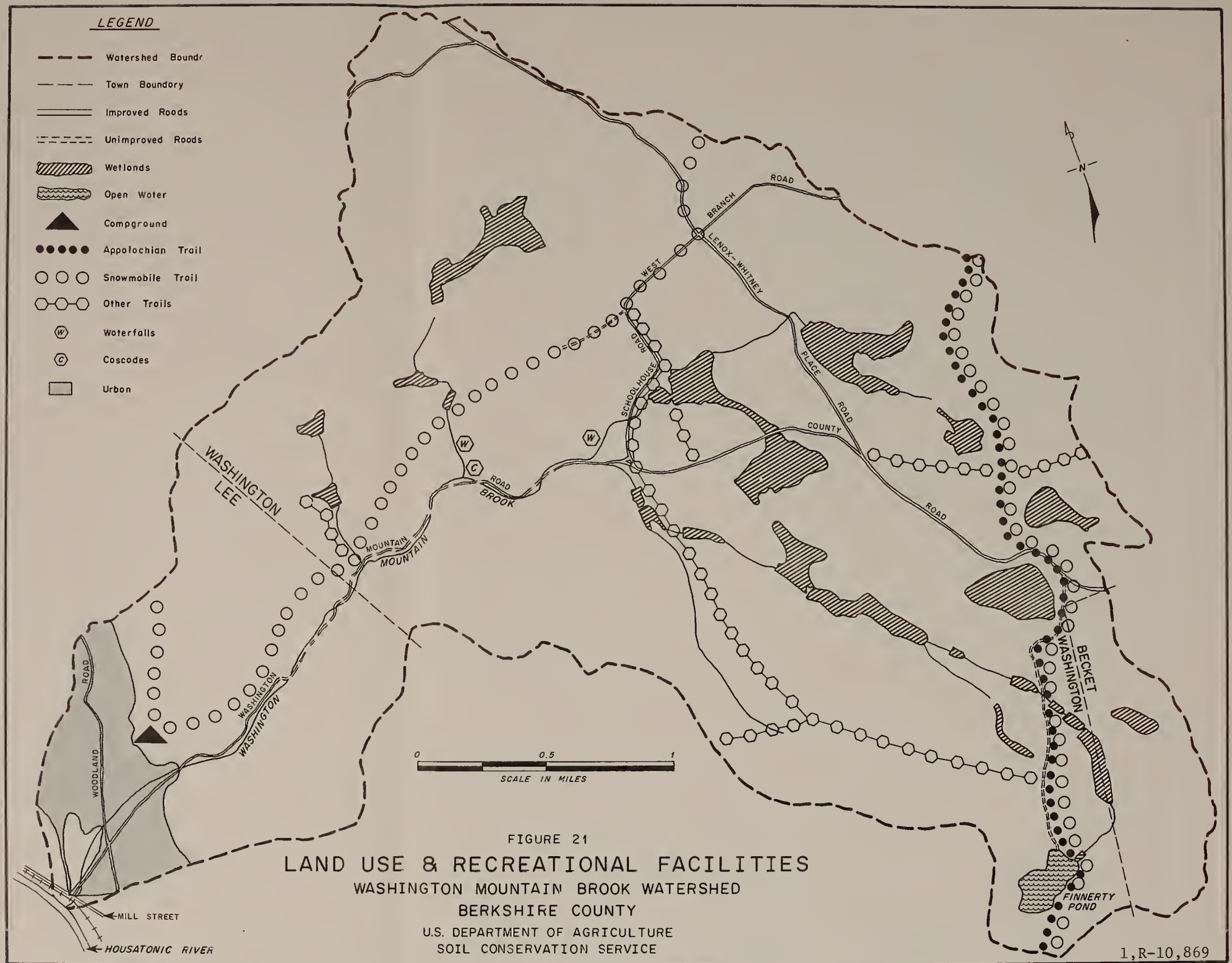


FIGURE 21

LAND USE & RECREATIONAL FACILITIES

WASHINGTON MOUNTAIN BROOK WATERSHED

BERKSHIRE COUNTY

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

1,R-10,869

USDA-SCS HYATTSVILLE MD 1978

Fishing

Current use of the Washington Mountain Brook for fishing is primarily from children and local residents. Division of Fisheries and Wildlife personnel familiar with the area indicated that the brook is stocked annually with 300, 6- to 9-inch brook trout. Trout are stocked near the confluence of the brook with the Housatonic River. This stocking effort has been described by Fisheries and Wildlife personnel as a "kid stocking program." No quantitative data on the current fishing pressure in the brook is available from the Division of Fisheries and Wildlife. Two boys were observed fishing in the brook during the field surveys of the watershed.

Potential use of the watershed for fishing is primarily dependent upon a stocking program. Personnel from the Westboro office of the Massachusetts Division of Fisheries and Wildlife estimate that the present trout stocking program in the brook might support between 30 and 50 angling days annually. An angling day is estimated to be approximately 2 hours long; the success rate is two fish per angler day, and recovery is 50 percent. To increase fishing use of the brook, additional stocking would be required. At lower success rates, fishing pressure would be expected to decrease rapidly. This expected decrease might be offset to some extent by a change in the age group of the fishermen. Fishing pressure exerted by children may not be closely related to success rates.

Hiking

Current use of the watershed for hiking is facilitated by the presence of the Appalachian Trail, several unnamed trails and many unimproved roads. The Appalachian Trail passes through the eastern portion of the watershed in a north-south direction. The 16,000 foot length of the trail which passes through the watershed provides pedestrian access and hiking opportunities to local day hikers, as well as, those persons hiking a longer segment of or the entire Appalachian Trail. The trail joins Tyne Road in Becket south of the watershed, passes through the watershed and continues through October Mountain State Forest. Terrain along the trail in the watershed is fairly rugged. The trail crosses Bald Top Mountain, Walling Mountain, and skirts Finerty Pond and some wetland areas. The portion of the Appalachian Trail in the watershed is also used for snowmobiling in the winter. Other trails and unimproved roads in the watershed provide additional hiking and snowmobiling opportunities.

Potential use of the watershed would be enhanced if existing trails and roads were clearly marked to show lengths of round-trip hikes and to direct hikers to points of special interest such as unique, natural or scenic areas. According to SCS (1969) the potential capacity of a hiking trail is 100 persons per mile per day. This would indicate a potential capacity use of approximately 300 persons hiking through the watershed on the Appalachian Trail or a significantly larger number of people walking on portions of the trail. Unimproved roads could also support additional hikers.

Camping

Existing use of the watershed for camping is concentrated in the October Mountain State Campground. This camping area is located near the western boundary of the watershed in the town of Lee. It has 50 campsites equipped with picnic tables and fireplaces and two modern comfort stations with hot showers. The campground is officially open from April 1 through October 1 of each year.

A review of attendance data for 1974 and 1975 provided information about the geographic origin of user, length of stay and seasons and days of the week when heaviest use occurred. Approximately 10,750 persons used the campground during this period. Although the campground was not officially open from October through March, some occupancy occurred during this period. During April and May, weekend use was heavier than weekday use. Because of cold weather, occupancy at full capacity was not reached on the 1975 Memorial Day weekend. High occupancy occurred during July and August. The campgrounds were occupied nearly to capacity on many weekdays, and there were often more than 100 turnaways per night on weekends. A small private campground across the street from the October Mountain Campground can accommodate a small percentage of the overflow. Maximum use occurred during August. Although there were many turnaways on weekends in August, low weekday occupancy reduced the total for the month well below capacity.

Length of stay ranges from one night to the maximum allowed occupancy of 2 weeks. The majority of campers stay one night which indicates that they are stopping at October Mountain on the way to other destinations. Many other campers arrive on Friday and remain for an entire weekend. Cultural activities at Tanglewood and in the general area may account for some of the heavy weekend occupancy during the summer.

Most of the campers using the October Mountain Campground stay in tents. A relatively small number of campers stay in trailers. A very small number of campers are hikers passing through the area.

Based on 1975 data, approximately one-third of all campers are from Massachusetts. New York and Connecticut were the origins of the second and third largest groups of campers. One-third of the campers were from states outside of New England, New York and New Jersey.

Potential use of the camping area is somewhere between the extreme maximum use and the design annual capacity (as defined by the 1976 Massachusetts Statewide Comprehensive Outdoor Recreation Plan).

The length of season for the Berkshire Planning Region is from May 15 to September 24, or 133 days. The number of design days within this period is 46.8. The number of persons suitably accommodated by one campsite is four. Therefore, the extreme maximum use is 4 persons x 133 days x 50 campsites or 26,600 annual activity days. By design days, the annual capacity would be 4 persons x 46.8 days x 50 campsites or 9,360 annual activity days.

The present annual use by approximately 10,750 persons is about the expected level of accommodations by design capacity standards. The potential use is reasonably somewhere between 9,360 and 26,600 annual activity days.

Hunting

Existing use of the watershed for hunting has not been estimated quantitatively. Ninety percent of the watershed is within the October Mountain State Forest which, according to the Massachusetts Division of Fisheries and Wildlife, is a popular hunting area. Deer, gray squirrel, porcupine, ruffed grouse, woodcock, and raccoon are hunted. Deer kill for the watershed was estimated to average less than one per year. This estimate is based on the number of deer kills for the towns of Lee and Washington and the amount of deer range in each town which falls within the watershed. The watershed also supports limited waterfowl hunting and some trapping for beaver, otter, mink, and muskrat.

Potential use of the watershed would be enhanced by providing easier access to the area. Local hunters indicated that the lack of easy access to the area made the watershed less attractive than nearby areas. A wild turkey population has been established in the forest and a spring gobbler season has been established for 1980.

Archaeological, Historical and Unique Scenic Resources

An archaeological and historical survey of the watershed was conducted by a professional archaeologist in the fall of 1975. A follow-up prehistoric survey was conducted in the fall of 1977. (A condensed report is included in Appendix B.)

Prehistoric Survey

Examination of prehistoric Indian artifacts in local collections and at the Berkshire Museum and Stockbridge Library did not indicate any sites in the watershed. Surface walks also failed to produce a single Indian artifact. To verify the conclusion that no prehistoric Indian sites exist in areas to be disturbed by project installation, further field studies were conducted in the fall of 1977. These studies included excavation at 100 foot transects, and failed to expose any Indian artifacts. Thus, the conclusion that "there are no significant prehistoric Indian sites."

Historic Survey

County maps of 1858 and 1876 show evidence of a village in the watershed. This is reinforced by the presence of a cemetery dating back to the mid-19th century. A total of 19 historic sites were found during the field survey. Most of them consisted of cellar holes--some partially filled, and barn cellar holes adjacent to houses.

The Washington Mountain Brook Watershed is unique in that within it is the preserved remains of a mid-19th century agricultural village. The survey shows that for the most part, the village remains are intact.

No sites included in the National Register of Historic Places are located in the Washington Mountain Brook Watershed.

At the request of the staff archaeologist for the State Historic Preservation Officer, additional studies were undertaken to determine if the agricultural village was eligible for nomination to the National Register of Historic Places as a Historic District. The village was determined to be eligible for nomination.

Scenic Value

The Washington Mountain Brook Watershed provides the observer with a variety of sights, sounds, and smells which are common to undeveloped portions of the Berkshire Mountains. An exceptionally beautiful virgin hemlock stand, as large as any in western Massachusetts, is located immediately north of Finerty Pond. The watershed has "high" visual quality according to the Office of Planning, Department of Natural Resources (now DEM).

Washington Mountain Brook offers the observer a variety of attractive sights. Vistas include beaver ponds, meadows, waterfalls and cascades, tree-covered and open streams, gentle sloping valleys and steep, V-shaped valleys. Because the watershed is generally undeveloped, the brook is free of refuse and the water is clear. Fish are often visible in the stream.

Air quality in the watershed is excellent. Noxious and/or unnatural odors were not observed during the field surveys.

The areas of the watershed in the October Mountain State Forest are generally free of unnatural sounds. In many areas, the visitor is isolated from outside sounds.

Soil, Water and Plant Management Status

The Berkshire Conservation District is the legally constituted unit of state government responsible for administering soil, water and related conservation work as specified in Chapter 21, of the Massachusetts General Laws. Technical assistance is provided to individual landowners, towns and others, through working agreements with the Soil Conservation Service and other federal and state agencies.

Land treatment measures associated with the planned project are to be accomplished through the regular ongoing program. Approximately 100 acres of open land have been adequately treated. Approximately 33.5 miles of skid trails and logging roads have had erosion control measures taken. Hydrologic cultural operations on forest land accomplished to

date include: timber stand improvement, 20 acres marked and 20 acres treated; harvest and intermediate cuts, 298 acres marked and 268 acres cut.

There is a forest land management plan for the entire 5,150 acres of October Mountain State Forest within the watershed. In addition, two conservation plans covering 300 acres have been prepared. The Massachusetts Division of Forests and Parks manages the State Forest primarily for recreation and timber production.

Approximately 90 percent of the watershed has been soil surveyed.

Adequate fire protection is provided by the Massachusetts Department of Environmental Management, Division of Forests and Parks, in cooperation with the U.S. Forest Service, through the Clarke-McNary Cooperative Forest Fire Control Program. Other available federal-state cooperative forestry programs include Cooperative Forest Management, Cooperative Forestation, Cooperative Insect and Disease Control, and General Forestry Assistance.

Nonstructural Measures

The town of Lee is now participating in the Emergency Program of the National Flood Insurance Program. Participation in the Emergency Program dictates that the town of Lee must (1) require building permits for all new construction and substantial improvements and (2) review the permit to assure that sites are reasonably free from flooding. For its flood-prone areas, the town must also require: (1) proper anchoring of structures, (2) the use of construction materials and methods that will minimize flood damage, (3) adequate drainage for new subdivisions, and (4) that new or replacement utility systems be located and designed to preclude flood loss.

It is expected that Lee will take the necessary steps to participate in the Regular Program of the National Flood Insurance Program. This would include implementing additional flood plain management regulations to regulate development subject to significant flood loss within the designated flood hazard areas.

The present Flood Insurance Administration (FIA) flood boundary maps are preliminary and show approximate flood prone areas for use in the emergency phase of the program. Detailed studies will be scheduled in the future which, under present FIA guidelines would define the boundary of the 100-year flood upstream along Washington Mountain Brook to a point above Newton Bridge. As a rule, these studies are required to make maximum use of available data which is still current. Therefore, project derived data relating to flooding and flood plains would probably be utilized.

Water Resource Development Projects

During the 1960s a Watershed Plan was developed for the Washington Mountain Brook Watershed. The watershed plan called for the construction of three multiple-purpose impoundments, installation of land treatment

measures and channel work along portions of Washington Mountain Brook. Progress to date includes construction of the Washington Mountain Lake dam and dike, and clearing of the planned recreational pool.

The dam is of compacted earthfill with a drop inlet principal spillway and an earth emergency spillway. In operation for the prevention of floods, the dam automatically regulates runoff from the 832-acre watershed by the principal spillway and the floodwater storage provided. The principal spillway releases the temporarily stored floodwater at a rate which will minimize downstream flooding. The emergency spillway will safely pass storm flows in excess of the volume stored by the reservoir and the principal spillway release. A water control gate was installed to permit draining of the reservoir for management or during emergencies. At present, the water control gate is open and no permanent impoundment exists.

The structure operates as a single-purpose flood control structure controlling water levels in the reservoir area as follows.

Frequency (percent chance)	Reservoir Stage Elevation msl	Duration Days	Inundated Area-Acres
50	1778.7	3	70
20	1779.2	4	82
10	1779.5	4 1/2	88
4	1779.9	5	96
2	1780.1	5 1/2	100
1	1780.5	6 1/2	103

A bottom release facility was installed to minimize temperature effects downstream and to ensure stream flow even during periods of drought, once the planned recreational impoundment is created.

Recreational use of Washington Mountain Lake will only involve boating and fishing. It is anticipated that construction roads will be improved to provide better access to this site.

Approximately 8 square miles of the Washington Mountain Brook Watershed serves as a supplementary water supply source for the town of Lee. Development of this drainage area for water supply was authorized in 1897 by the General Court of Massachusetts via Chapter 234. The principal features of this development are Finerty Pond and a streamflow intake structure.

Finerty Pond has a drainage area of 0.20 square mile. It has a low dam providing storage of about 2,000,000 gallons. Water is withdrawn through a 6-inch siphon about 800 feet in length. The flow is discharged to a stream channel eventually combining with flow from other areas of the watershed.

The water intake facility is located about 1 mile upstream from the Housatonic River at about elevation 1,150 feet mean sea level. This facility consists of a masonry wall which diverts streamflow into an intake structure connected to an 8-inch pipe leading to town. Water entering the intake is metered and chlorinated as it passes through a small chlorinator house located a short distance below the intake.

WATER AND RELATED LAND RESOURCE PROBLEMS

Floodwater and Sediment Damages

Historical Floods

Generally, records of floods on particular streams have only been kept after floods began to affect man. Along Washington Mountain Brook, this period starts at about the turn of the century. Photographic evidence of serious floods on Washington Mountain Brook is on file from as early as 1914. Other documented major floods occurred in 1927, 1936, 1938, 1949, and 1955. At the least, minor flooding occurs about once every 5 years.

The most complete record of flooding and flood damages available is for the September 1938 flood, approximately a 100-year recurrence interval (1-percent chance). This flood was caused by 4 days of heavy rainfall climaxed by a hurricane on September 21.

The estimated direct damage within the watershed in 1938 dollars was: bridges, $40,000; roads and appurtenances, $28,000; stream sediment removal, $14,000; residential, $20,000. These damages reflecting 1980 cost would amount to about $1,130,000.[1/]

The most frequent damage has been to roads, bridges and the stream channel. Bridges, such as Newton Bridge, have been undermined several times by floods in the past. Extensive dredging of the stream channel has been required following major floods.

The volume of material removed following the 1938 flood was about 25,000 cubic yards. High water velocities (8-12 plus feet per second) and large flows cause serious movement of boulders and debris throughout the upper reach of Washington Mountain Brook. Much of this material was deposited on the alluvial fan, beginning at the entrance of the Newton Bridge on Washington Mountain Road. This results in flood flows bypassing this bridge and flowing down the Washington Mountain Road to damage houses in the lower reaches (see Figure 22). When the floodwaters bypass the Newton Bridge, Washington Mountain Road is heavily damaged by removal of pavement and deposition of boulders and debris (see Figure 24). This road was the most direct access route from Lee to the October Mountain State Forest.

Repairs and improvements to Washington Mountain Road above the water supply intake dam have been neglected because of the present futility of maintaining a road subject to such frequent flood damage.

On the average, annual removal of sediment from the lower damage area is about 4,100 cubic yards. The estimated volume of deposition for a 100-year flood would be in excess of 26,000 cubic yards.

1/ Based on Engineering News Record Building Cost Index.

FIGURE 22 SEPTEMBER 1938

The Miller residence , Washington Mountain Road in Lee.

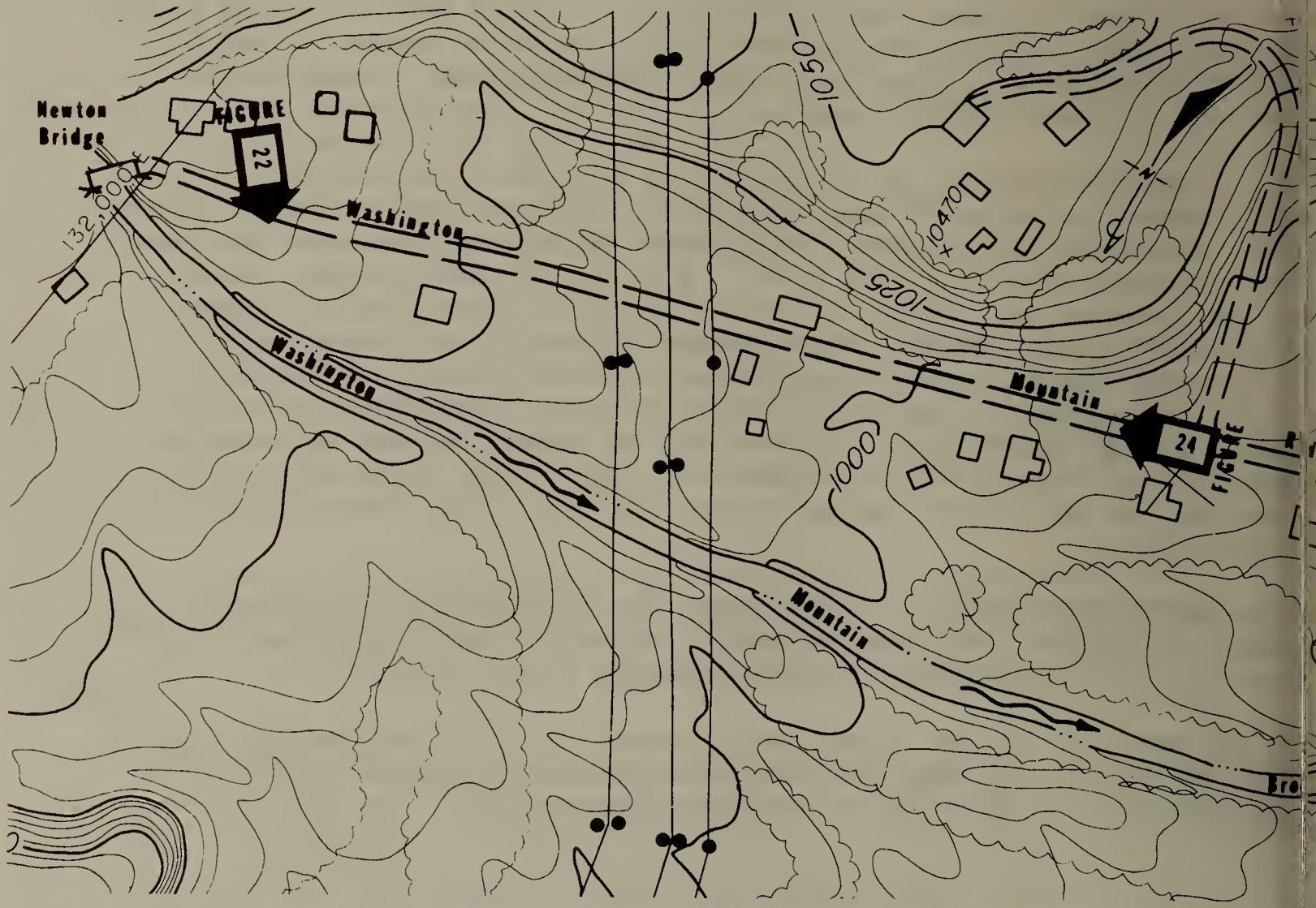


FIGURE 23 LOCATION MAP~FLOOD DAMAGE PHOTOGRAPHS

Owen Johnson of Stockbridge, with Mrs Johnson and Frank J. Diamond of Lee, walked up the Washington Mountain Road at Lee recently to view the damage. Mr. Johnson is interested in aiding towns in getting Federal aid for protection against further floods.

FIGURE 24

Not only is the sediment deposition an expensive damage item ($90,000-$95,000 removal cost) but this large volume of debris can (and has) completely filled the stream channel and bridge openings, significantly raising flood stages and altering the course of stream flow.

The Washington Mountain Intake Dam for water supply is usually completely filled with sediment following major floods. Some previous intake structures have been completely destroyed.

Appendix C of this report contains additional supporting data relating to floodwater and sediment damages and the other water and related land resource problems.

Physical Setting

Washington Mountain Brook has deposited an irregularly shaped alluvial fan at the base of the mountain front.

The typical alluvial fan is an accumulation of sediment brought down by a stream descending through a steep ravine or canyon. Consequently, when the stream emerges from the confined area with a lowering of velocity most of the sediment is dropped and spreads out in the shape of a fan. Generally, the fan is roughly semi-conical with the apex at the upper end. The sediment of an alluvial fan may range in size from fine silt and sand to boulders. The streams which create and supply debris to fans are vigorous agents of erosion and they commonly transport enormous volumes of sediment. Boulders, cobbles and gravel are deposited at the upper end of fans and the finer sands, silts and clays are carried to lower elevations. The steepness and size of the alluvial fan varies with the geology, climate and watershed size.

The development of many fans is characterized by erratic and sudden depositional events. The volumes of sediment deposited on fan areas below mountain slopes and canyons following heavy rains can be enormous.

Streams on the fan characteristically change course frequently and develop a series of distributaries on the deposit.

Due to preexisting geological formations, the Washington Mountain Brook alluvial fan has an irregular shape, in contrast to a typical fan. The period of glaciation which preceeded the development of the alluvial fan created a terrace paralleling the Housatonic River. This terrace restricted the development or spreading of the fan, thereby drastically reducing the steepness of the fan to 1°-2°. (Normally a fan formed from a watershed of this size, with a steep ravine, would have a steepness ranging up to 15°.) The percentage of sediment deposition is directly related to the steepness or slope of the fan. With a 1° fan, the deposition within the fan will be more nearly complete than that for a 10° or 15° fan of the same parent material.

Washington Mountain Brook has changed course several times in the past. Field observations indicate past attempts to manage and control the location of the stream. Mounds of debris mark the previous location of stream flow. Generally the stream changes course during or following major flood events. The general tendency is for the stream to move in pendulum fashion from one side of the fan to the other, unless impeded by physical development, such as roads, houses, or dikes.

The present flood hazard and associated sediment problems of Washington Mountain Brook are complex and difficult to assess, but very real. The National Flood Insurance Administration's (HUD) Guidelines and Specifications for Flood Insurance Studies states the following concerning alluvial fans:

"These shallow flooding conditions are unrelated to or are not readily associated with channel flooding and flood profiles; reliable determinations of depths, extent of flooding, and direction of flow by normal open channel hydraulic methods would be extremely difficult if not impossible.

"Alluvial fan flow takes place on a depositional geomorphologic feature that is, in fact, the result of such debris-laden flow generally associated with mountains and areas of precipitous slope. The alluvial fans represent the location of an abrupt change of gradient for precipitous channels to a fan, delta, or cone having a flatter slope. Alluvial fan channels are unstable because of deposition from mudflows, debris deposit, meander in soft alluvium, and scour of flows with high sediment content. An area of shallow overflow in one flood may be in a new channel carved by the next flood.

"Although undisturbed alluvial fans are easily recognized, the rapid and unpredictable changes in existing channels due to deposition and heavy debris loads make detailed analysis of flooding on alluvial fans extremely difficult. Where permanent, man-made channels exist with adequate capacity and adequate provisions for debris removal, alluvial fan flooding can be analyzed by traditional open channel hydraulic methods. However, in most cases, such stabilized channels have not been constructed and the entire active geomorphologic feature must be considered susceptible to flooding, even though any one flood occurrence may not inundate all of it.

"No floodways will be determined for alluvial fan flooding because of the absence of a stable, defined channel."

The procedures described in the Guidelines state in part: "will be adequate to determine areas susceptible to alluvial fan flooding, but they do not indicate the severity of the possible local hazard. Any available information, including reports of local residents, historical data, and especially photographs of past floods and historic fan conditions, should be included in the report text to document the possible velocity, depth, and debris hazards and the frequently shifting channels that exist on the alluvial fans."

Hydrologic Data

The location of Newton Bridge can be designated as the apex of the alluvial fan. At present, fan flooding occurs at this point for discharges in excess of 1600-1700 cubic feet per second. The following table is the present frequency-discharge relationship for this location.

TABLE 14

PRESENT FREQUENCY-DISCHARGE* REACH 2

Exceedence Probability	Percent Chance	Recurrence Interval (yrs.)	Peak Discharge (cfs)
.01	1	100	2940
.02	2	50	2420
.04	4	25	2170
.10	10	10	1760
.20	20	5	1270

*Watershed controlled by Washington Mountain Lake Site = 1.3 square miles
Uncontrolled Drainage Area = 6.8 square miles

Fan flooding is more frequent at a point about midway between Newton Bridge and Woodland Street. The capacity for the channel is such that for discharges associated with exceedence probabilities less than .20, flooding on the south side of the channel will result. These overbank flood flows are prevented from returning to the channel by the dredged debris areas, and consequently flow over the fan to a point below Woodland Street where combined flow is restricted by the terrace formation.

The lower part of Washington Mountain Brook is also susceptible to flooding by the Housatonic River. The Housatonic River has very little influence for floods with an exceedence probability greater than .10, and the extent of influence for an exceedence probability of .01 would be limited to below the first Washington Mountain Road bridge (approximately 600 feet upstream of the confluence) due primarily to the stream channel gradient and the presence of the bridge structure.

Flood damages resulting from "backwater" are typical of the damages resulting from major floods on the Housatonic River. The greatest hazard is from Washington Mountain Brook, where severe flooding occurs with little or no warning. The depth of flooding can exceed that from the Housatonic River, but in addition highly erosive velocities of the brook's flood flows are a threat to all structures within the flood plain.

The present frequency-discharge relationship for Washington Mountain Brook for the vicinity of Mill Street is as follows:

TABLE 15

PRESENT FREQUENCY-DISCHARGE* REACH 1

Exceedence Probability	Percent Chance	Recurrence Interval (yrs.)	Peak Discharge (cfs)
.01	1	100	3120
.02	2	50	2580
.04	4	25	2300
.10	10	10	1870
.20	20	5	1350

*Watershed controlled by Washington Mountain Lake Site = 1.3 sqaure miles
Uncontrolled drainage area = 7.7 square miles

Figure 25 is a map on which the alluvial fan is depicted. Within the fan is the present 100-year flood plain, representing the current flood hazard. The 100-year flood plain covers approximately 40 acres.

Damageable property within this 40 acres are: 35 acres of land; 4 road bridges; 2,100 feet of highway; and 35 structures, of which 22 are residential properties.

The average annual damages attributed to floodwater and sediment are:

Type of Damage	Average Annual Damage
Sediment and Debris	$22,720
Roads and Bridges	60,870
Utilities	2,300
Residential Property	2,690
Total	$88,580

The drainage area of the Housatonic River, just upstream of the Washington Mountain Brook confluence, is about 170 square miles, while the Washington Mountain Brook Watershed is only 9.0 square miles (ratio 18.8:1). However, the ratio of peak discharges for the 100-year flood is approximately 4:1, although, the likelihood of concurrent peaks is extremely remote. Washington Mountain Brook will peak shortly following most storms, and can contribute to temporary rises and early flooding along the Housatonic River, (see Appendix C, Page C-7) during regional floods. This flooding is usually followed 12-24 hours later by the main stem peak, which is greater and causes more extensive flooding and damage.

Erosion Problems

Throughout Reach 3, there are numerous areas where sliding banks, 50 to 80 feet high, and caving streambanks are subject to undercutting by channel erosion, especially during high flows. Trees and brush growing along the edge of the high banks also contribute to the debris load when the banks collapse.

"Mass wasting" is the movement of relatively large masses of earth materials by the force of gravity. This process is occurring on the valley walls of Reach 3 due basically to the soil (glacial till) lacking the strength to remain stable on the relatively steep slopes of the valley walls.

Several factors aid, or accelerate, the mass wasting process in Washington Mountain Brook. These include: frost action, ground water conditions, physical properties of the soil, narrow valley with steep slopes, streambank and bed erosion during storms, crowding of the channel by debris and the road. Remedial measures would need to consider all of these factors in order to be effective.

Other characteristics of the mass wasting process pertinent to this watershed include: (1) occurs during major storms; (2) delivers relatively large amounts of sediment and debris to the stream in a relatively short period of time; (3) is an ongoing natural process; (4) creates raw, exposed areas on the valley walls susceptible to frost action, sheet and rill erosion; (5) rapid delivery of large volumes of debris to streams can aid in the formation of potentially dangerous debris dams. (Subsequent failure of these debris dams produces "flash floods" and huge pulses of sediment and debris.)

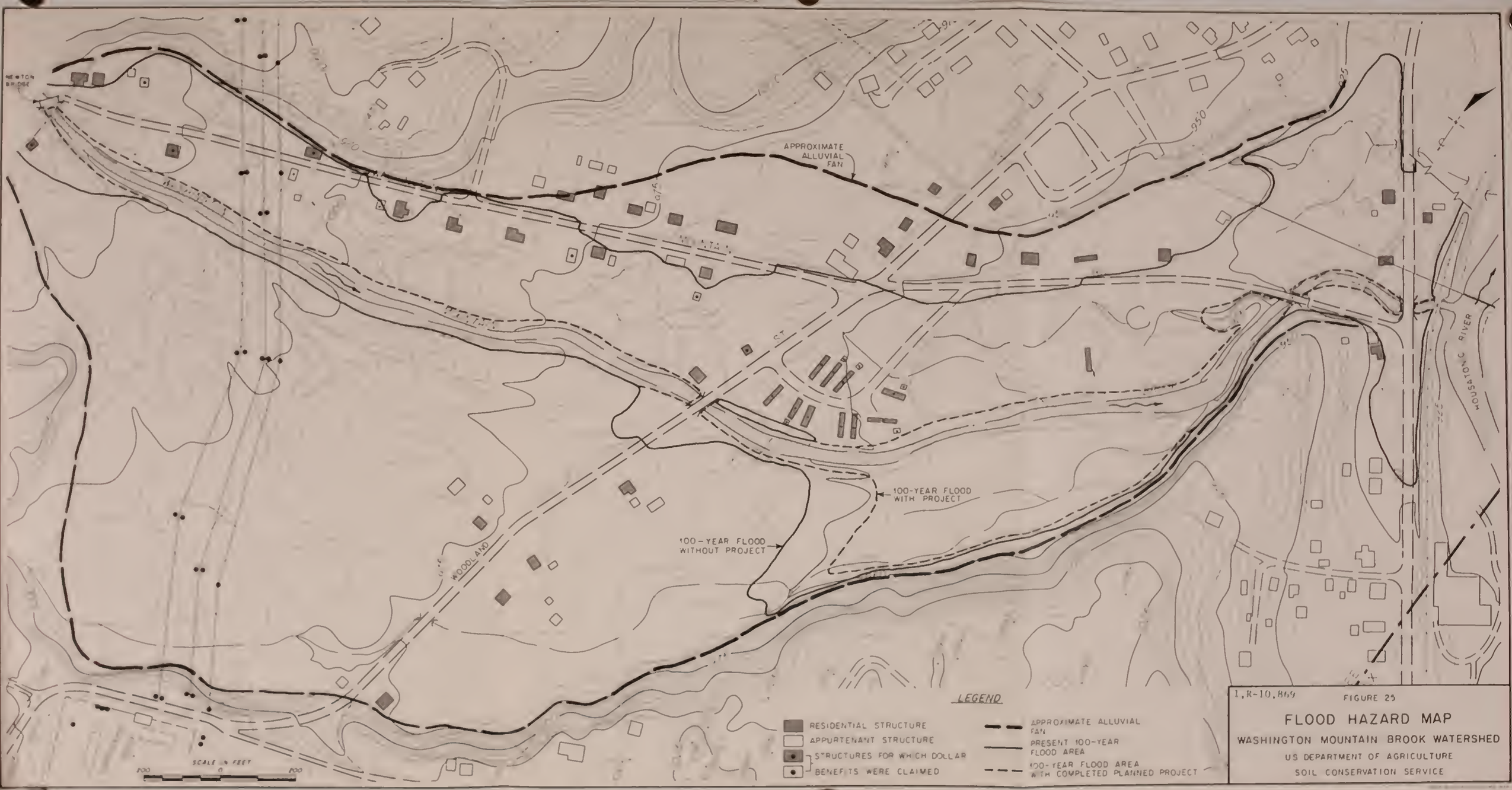
The total average annual volume of soil loss from all sources (mass wasting areas, sheet and rill, channel and streambank, etc.) which is delivered to the alluvial fan is about 9,100 cubic yards.

Municipal and Industrial Water Supply Problems

General

The Work Plan for Watershed Protection and Flood Prevention completed in 1967, stated in part:

> "The Town of Lee has a water supply intake on the Washington Mountain Brook to supply auxiliary water for its water system. The present water quality is very poor. The Town recently completed a large water reservoir in the adjacent Codding Brook Watershed.
>
> "As the demand for additional water increases, these facilities will not meet the need. Water storage on Washington Mountain Brook to increase the yield of the watershed would be very desirable. Studies conducted by the Town's Consulting Engineer showed that there is a need for storing 200 million gallons."



I,R-10,869 FIGURE 25

FLOOD HAZARD MAP

WASHINGTON MOUNTAIN BROOK WATERSHED

US DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Since that time, water supply shortages have replaced projected needs in the town of Lee and neighboring Lenox. As of January 1981, each town had only about a 30-45 day supply left, and each had tapped the emergency sources available.

The town of Lee, a local project sponsor, formally requested the Soil Conservation Service to assess the potential of the watershed project to satisfy the current deficit between the combined needs of Lee/Lenox and the combined safe yields of their respective supply systems.

The water supply problems of the towns of Lee and Lenox, together with the system improvements and measures taken by each community to cope with their problems are presented in the following discussions.

The towns of Lee and Lenox are practicing water conservation on a regular basis. Water conservation can be achieved through actions taken by the water utility to conserve within the supply system, or supply management. Also, through demand management, the water customer can conserve water at the home or business. Both towns have well managed water departments that maintain a higher degree of system efficiency than most other similarly sized small towns (Lee serves 6500 persons; Lenox serves 6,000 permanent residents plus 3000 seasonal residents).

Capital improvements of the supply systems in each town are often subject to approval at town meetings, a fact which often constrains the water department from making desirable supply system improvements.

Water conserving actions which fall into the supply management category include metering, leak detection and repair, pressure reduction, watershed management, and evaporation suppression.

Water conserving actions which fall into the demand management category include pricing, regulation, and education. Each of these three approaches can motivate the water user to change water use habits, install water-saving fixtures, or install a reuse/recycle system.

Lee

Data for the following was provided by the town's consulting firm of Tighe and Bond, Consulting Engineers.

Description of Source and Facilities -- The town of Lee derives its water supply from two separate watersheds; namely, the Codding Brook Watershed and the Washington Mountain Brook Watershed. Both watersheds are on the westerly slope of Washington Mountain and located in the northeasterly portion of Lee and westerly portions of Washington and Becket. The Codding Brook supply is the primary source of water for the town of Lee because of its high quality.

The Codding Brook supply emanates from a 2.06-square mile drainage area with elevations that vary from approximately 1,100 to 2,114 feet above mean sea

level (msl). This source is developed in two locations, Upper Reservoir and Vanetti Reservoir. The Upper Reservoir, with a storage capacity of 240 million gallons, supplies water to the high pressure service system in the town. In addition, Upper Reservoir releases stored water by way of a pipeline into the Vanetti Reservoir located at a lower elevation, during dry periods or times of heavy demands on the system. The Vanetti Reservoir has a surface elevation of about 1,128 msl and is used as a settling basin and intake reservoir. Water passes through it from the watershed and the Upper Reservoir into the pipelines of the low pressure system. The storage capacity of Vanetti Reservoir is less than 1 million gallons, and alone can only store a fraction of the daily water consumption.

Since the water from the Codding Brook Watershed is of high quality when flows are normal, the only treatment required in the past has been chlorination. Chlorination facilities have been provided on both the low and the high pressure systems for the purpose of disinfecting the water.

The Washington Mountain Brook supply is from a 7.95-square mile drainage area with elevations varying between 1,150 and 2,263 msl. The supply facilities on the Washington Mountain Brook consist of a small masonry wall which diverts the flow of the brook into an intake structure connected to pipelines leading to town. The water surface elevation at the intake is approximately 1,150 msl.

The drainage area above the intake can be separated into three segments:

(1) An area of 0.20 square miles which drains into Finerty Pond, from which flow by means of a syphon system is limited.

(2) Extensive swampy areas totaling 4.04 square miles which are of little value in contributing to the safe yield of the watershed, since evaporation in these swamps is excessive during normal dry periods and periods of low precipitation.

(3) An area of 3.71 square miles which drains directly into the brook above the intake. The intake structure provides no storage, and the safe yield of the watershed is limited to the dry weather flow of the brook plus, a small quantity of water drawn into the brook during periods of low runoff from Finerty Pond through the syphon. This syphon discharges water into the brook which in turn flows down the watershed valley to the intake structure.

The present development of the Washington Mountain Brook Watershed for water supply does not provide for a high quality source. During storms and periods of heavy runoff, the water in Washington Mountain Brook becomes colored and contains large quantities of sediment. The intake structure provides no opportunity for the "settling out" of sediment. For this reason and the insignificant safe yield, the Washington Mountain Brook Watershed is not used as the primary source of water, but rather as a standby source in the event of an emergency.

The total safe yield of the town of Lee's water supply sources is approximately 849,000 gallons per day. The Codding Brook Watershed accounts for the entire safe yield, with the Upper Reservoir having a safe yield of

750,000 gallons per day, and the Vanetti Reservoir having a safe yield of 99,000 gallons per day. Since the Washington Mountain Brook system does not provide significant storage, the safe yield is, for all practical purposes, negligible. Chlorination facilities have also been provided for the Washington Mountain source for treatment.

The quality of the water from the Codding Brook system during normal flows is quite high according to laboratory analysis conducted by the Massachusetts Department of Environmental Quality Engineering. The quality is well within the Primary Standards established by the Federal Safe Drinking Water Act. The only characteristic that appears high is manganese, which is related to the secondary standards. Manganese is an aesthetic problem, in that it causes discoloration of fixtures and laundry. There is no health problem associated with manganese at the concentrations found in the water. However, because of turbidity and color problems which occur after heavy rains and substantial runoff in the Codding Brook drainage area, it is expected that eventual filtration of the supply will be required in order to meet the new Federal Safe Drinking Water Standards established by the federal government and being enforced by the State Department of Environmental Quality Engineering.

Turbidity interferes with the chlorination process and the water is likely to have higher bacteria counts because of this. The water quality of Washington Mountain Brook is relatively the same as the Codding Brook water.

The existing water distribution system within the town of Lee consists of 12 inch and smaller cast iron and asbestos cement pipelines with some galvanized steel pipelines in the older areas of town. The service area of the distribution system includes a portion of Lenox known as Lenox Dale. Lenox Dale, because of its remoteness from the Lenox water supply system, continues to be served by the Lee system, an arrangement which originated with the Berkshire Water Company.

Supply Management - Since 1950 Lee has regularly replaced deteriorated water mains, and since 1970 the town has replaced approximately 3 miles of water main at a cost of $250,000. Another aspect of water department operation and maintenance are leak detection and repair efforts which consist of annual visual inspections of all the water lines, and periodic leak detection studies. A system-wide pitometer leak detection program was conducted in 1972, and a number of joint leaks and small breaks repaired. Presently, the town is accepting bids for a system-wide leak detection effort utilizing electro-acoustic methods.

At various times in the past, the town water department has evaluated metering, but never decided it would be a cost-effective action. The department has recently decided to purchase two or three large meters to monitor use by the two large industrial users. The meters, which cost approximately $2000 each, will enable the department to refine the industrial use estimates, and in turn the residential consumption.

Lee is currently reevaluating the cost-effectiveness of purchasing and installing meters at an estimated cost of $412,000. Town officials are hopeful that voters will approve a metering program once construction of the Washington Mountain Brook reservoirs is approved.

Pressure reducing valves are used extensively throughout the Lee water distribution system. This includes two large main pressure reducing valves, as well as pressure reducing valves on the lines to each service connection, which all together serve to reduce home water pressure from 115-120 psi to 60-70 psi. The use of these valves serves a conservation purpose by reducing the amount of water lost through existing leaks, and by reducing the stress on the lines which higher water pressure would cause.

Presently, the town has made an emergency water supply connection to Goose Pond, is receiving water from the intake on Washington Mountain Brook, and is preparing to pump water from Laurel Lake.

Demand Management - In the years following the regional drought of the early 1960s, the town of Lee provided an adequate supply of water to meet consumer demands, until the summer of 1979. As a result of a period of below average precipitation, the town's vulnerability to normal fluctuations in precipitation became apparent. That summer the town successfully reduced water use by requiring that customers use hand-held hoses when watering outside. The following winter produced record low precipitation, and in the summer and fall of 1980 all outside use of water was banned. As the drought continued into the fall of 1980 water customers were continually reminded, through the media, of the need to conserve water use. The newspapers carried daily reports and features on the water supply situation, not only in Lee, but in the Lenox and Pittsfield areas. As of November, rainfall was approximately 65 percent of average for the period June 1 to October 31.

Further evidence in demand management is the 123 gallon per capita per day value used to estimate future demands. Historically, daily per capita consumption has increased about 1 gallon per year. The town of Lee is confident in their water conservation program, and has estimated future needs based on present consumption rates, which would effectively alter the historic trend.

The town of Lee has expanded its public education program through the Rotary and school system. Water conservation pamphlet inserts are planned for the spring mailing of water bills.

Water Demand and Needs -- The town of Lee's present population is about 6,500 persons and the municipal water supply system serves about the same population. In 1976, Lee had an average daily usage of 1,300,000 gallons, supplied by the municipal system. Peak rates ranged from 1.5 to 1.8 million gallons per day. Approximately 500,000 gallons per day (gpd) of the average usage is attributed to the local paper industry. Industrial water consumption is primarily for sanitary facilities, boiler demands, hot water facilities, and limited manufacturing processes. A large

majority of water used by the paper industry is for processing and is derived from sources developed by the industry. Municipal water is used only for those activities or processes which require water of potable and consistent high quality.

Future demand data is based on population projections obtained from the Berkshire County Regional Planning Commission. The population for the town of Lee in 1990, 2000 and 2020 is projected respectively to be 6,840, 7,160 and 7,800 (extrapolated). These increases indicate a very slow rate of growth. Future residential water demand is based on the present per capita use rate of 123 gpd. This residential demand includes the small commercial demands.

Projections of industrial usage or demand is more difficult to determine because of the many unknowns, such as: the processes, facilities to be installed and the number of employees. The basis for projections used here is that the new industries will be "dry industries," in that potable water from the municipal system will be used only for sanitary purposes, cleaning purposes, drinking, boiler make-up water and kitchen facilities.

It is estimated that about 340 acres of industrial land will be developed between now and 2020, with 115 acres developed by 1990 and 178 acres by 2000. On this basis and using 2900 gpd per acre for "dry industries" for average usage the industrial demand can be estimated.

By the year 2020, the average total daily demand is expected to reach nearly 2.5 million gallons per day. Table 16 lists the water demand data and additional needed supplies projected for the town of Lee.

TABLE 16

WATER DEMAND AND SUPPLY DATA

TOWN OF LEE

	Daily Demand (gpd)[1/]			Supply (gpd)[1/]	
Year	Residential	Industrial	Total	Existing Safe Yield[2/]	Additional Needs
Present	800,000	500,000	1,300,000	750,000	550,000
1990	842,000	834,000	1,676,000	750,000	926,000
2000	881,000	1,016,000	1,897,000	750,000	1,147,000
2020	960,000	1,486,000	2,446,000	750,000	1,696,000

1/ Gallons per day.

2/ The present combined safe yield is 849,000 gpd. With the development of an additional source, and if the present supply required further treatment, the Vanetti Reservoir would be abandoned, this would reduce the existing safe yield to 750,000 gpd.

The town of Lee presently utilizes the flat rate billing method for water charges. Reports and studies made by meter companies and published in the American Water Work Journals indicated a wide range of water conservation as a result of placing meters in services and charging according to water use. Figures range from 20 to 50 percent for average usage and much higher percentages of savings for peak hour usage.

Tighe and Bond is of the opinion that the town of Lee residents are not as wasteful as the above data might indicate due to the economic status of the area and the climatic conditions. Due to the elevation of the area and naturally moist ground conditions from ground water flow and runoff from large watersheds, the use of water is not exceptionally high for nonessential purposes. On the basis of this data, it can be expected that with the installation of meters and the establishment of a water rate system the town of Lee could see a small reduction in residential water use, but not of a magnitude that will defer the development of a water source to meet the projections listed in Table 16.

Lenox

The following was initially provided by the town's consulting firm of Whitman & Howard, Inc., Engineers and Architects. The material has recently been updated by J. F. Moynihan and Associates, Inc.

Water Demand and Needs -- "In 1976, Lenox had an average daily usage of 680,000 gallons per day. By the year 2020, the average daily demand is expected to reach 1,350,000 gallons per day. This is based on a permanent population of 8,000 people, a summer population of an additional 4,000 people and a per capita usage of 150 gallons per day. The population projections were obtained from the Berkshire County Regional Planning Commission through the year 2000 and were extrapolated to the year 2020 by Whitman & Howard, Inc." (In 1980, the average daily demand was 1 million gallons.)

There is presently only one industry in Lenox and its water consumption is relatively low. However, there is a possibility of General Electric establishing an operation in the town which would significantly increase the water demand.

"As for commercial usage, Whitman & Howard, Inc. believes that the additional summer population water consumption should be classified as commercial as it is primarily associated with motels, restaurants, etc." In addition, possibly 10 percent of the permanent population water usage should fall under the commercial category.

There are a number of conservation activities in the town that are now being practiced.

- A Tri-Town Health Department proposal, which was later voted into law by the towns, states that water saving fixtures must be used on all new plumbing, or repairs done on existing plumbing.
- Virtually 100 percent of the consumers in Lenox are now metered.
- The Tri-Town Rotary and the Berkshire County Regional Planning Commission sent out letters requesting water conservation and listing methods of saving water.
- The Lenox Department of Public Works has been actively locating and repairing leaking water mains. In 1979, repairs were made on 48 water mains throughout the town.

- The Lenox Department of Public Works has sent out letters to the highest water users requesting a 25 percent reduction in water use.

J. F. Moynihan and Associates, Inc. of Lee are presently running a computer analysis of the Lenox Distribution System. The analysis will enable the town to determine the effects of fire flows in given areas as well as determining possible areas of leakage and unaccounted for water losses. Results of the computer study will also allow the town to determine if larger pipes should be installed in certain areas of the distribution system.

Description of Source and Facilities -- The water system for the town of Lenox consists of three separate sections, each of which are supplied from different sources. The center of Lenox, Lenox Village, is supplied entirely by the town's Root Reservoirs; a southeasterly area of the town, Lenox Dale, is served from the town of Lee; and New Lenox, in the northeast portion of Lenox, is supplied with water from the city of Pittsfield.

Water reaches Lenox Village from the two Root Reservoirs via a 10-inch water main which reduces to 8 inches. This supply flows by gravity, except during high demand periods when a booster pumping station is activated to increase the flow. The piping network consists of mains ranging from less than 6 inches up to 12 inches, and an emergency connection is maintained to New Lenox (supplied by Pittsfield). The maximum safe yield of this system is 0.6 million gallons per day (mgd) and the maximum day supply possible from Root Reservoirs at present is 0.9 mgd.

At present, the agreement with Pittsfield to supply the northeast section of Lenox and New Lenox, is under review. Water pressure in North Lenox is as low as 40 psi, creating a problem for required fire flows. Pittsfield also presently has problems supplying sufficient water to its users, due to present low water storage conditions. The town of Lenox has used up to 300,000 gpd from Pittsfield. At least a portion of this must be made up by Lenox.

The Lenox Dale services are primarily in the area near Walker Street, at the Housatonic River. The area of New Lenox consists of mains of sizes of 6 to 12 inches along Lenox Road, East Street, and Main Street.

Based on the most recent water quality analysis and water quality standards, the Root Reservoirs will not require any treatment beyond chlorination. Therefore, considering the low treatment cost along with the gravity feed to the distribution system, this supply should be considered as the town's primary water source and should be augmented by a second water source during high demand periods. To continue using the existing Root Reservoirs and distribution system without improvements is precarious, to say the least.

In 1978, Lenox installed a 1.75 million gallon storage tank (known as Aspinwall storage tank) in Kennedy Park, to replace Woolsey Reservoir. Its purpose was to increase and stabilize the water pressure along Route 7. In order to pump water to the Aspinwall storage tank, a pump station was constructed below the Lower Root Reservoir. Eleven thousand feet of new 10 inch force main was installed connecting the pump station and the Aspinwall storage tank. Total cost of these improvements was $1,640,000.

Due to the severe water shortage in 1980, Lenox made two other improvements to their supply source and three emergency water connections. In addition, Lenox purchased additional water from the city of Pittsfield and, while available, from the town of Lee.

A diversion ditch was constructed to collect surface water, major and minor springs, and ground water from approximately 50 acres of watershed east of the Lower Root Reservoir. The water is then diverted through a sedimentation pond and into the Lower Root Reservoir.

Taking advantage of the existing drought conditions and an empty Upper Root Reservoir, the town undertook expansion of this water storage area. Approximately 150,000 cubic yards of earth was excavated, increasing the water storage by 80 million gallons, or one month's storage (consumption).

The cost for these two improvements was $369,000.

The following emergency connections were also made in 1980, at a cost of $171,000.

Golden Hill Road -

Work under this contract was done to supply additional water to Lenox from the town of Lee. It consisted of the installation of a 2400'8" ductile iron water main from the Lenox-Lee town line along Golden Hill Road to Patterson Street where it ties into an existing 4" line on Catherine Street.

Lawton Street -

This connection was the second leg of the Emergency System which brought water from Lee into Lenox. It consisted of installing an 8" ductile iron water main along Lawton Street from an existing waterline on Catherine Street to Cranwell Golf Course. There the line was tied into 1500' of above-ground Civil Defense pipe which ran to the existing water main on Walker Street to complete the Emergency Connection.

Tanglewood/Shadowbrook -

An emergency facility to pump approximately 400 gallons per minute from Stockbridge Bowl to the reservoir supply was constructed by the town in October 1980 after a State of Emergency was declared with respect to the water supply.

The project entailed the installation of a submersible pump in Stockbridge Bowl; then piping the water via Civil Defense pipe to a Booster Pump Station on West Street to pump the water up to the Lower Root Reservoir.

To pay for the improvements and emergency connections, the water use rates will nearly double in 1981.

Watershed management of the Root Reservoirs should be practiced, but not specifically for additional water supply. Proper management of the drainage area will maintain water quality and could possibly improve quality and quantity. However, this possible water quantity increase is indeterminate and relatively small when compared to the water needs of the town.

Table 17 lists the water demand data and additional needed supplies projected for the town of Lenox.

TABLE 17

WATER DEMAND AND SUPPLY DATA

TOWN OF LENOX

	Daily Demand (gpd)[1/]			Supply (gpd)[1/]	
Year	Residential	Commercial[2/]	Total	Existing Safe Yield	Additional Needs
Present	612,000	68,000	680,000	600,000	80,000
2000	959,000	241,000	1,200,000	600,000	600,000
2020	1,080,000	270,000	1,350,000	600,000	750,000

1/ Gallons per day.

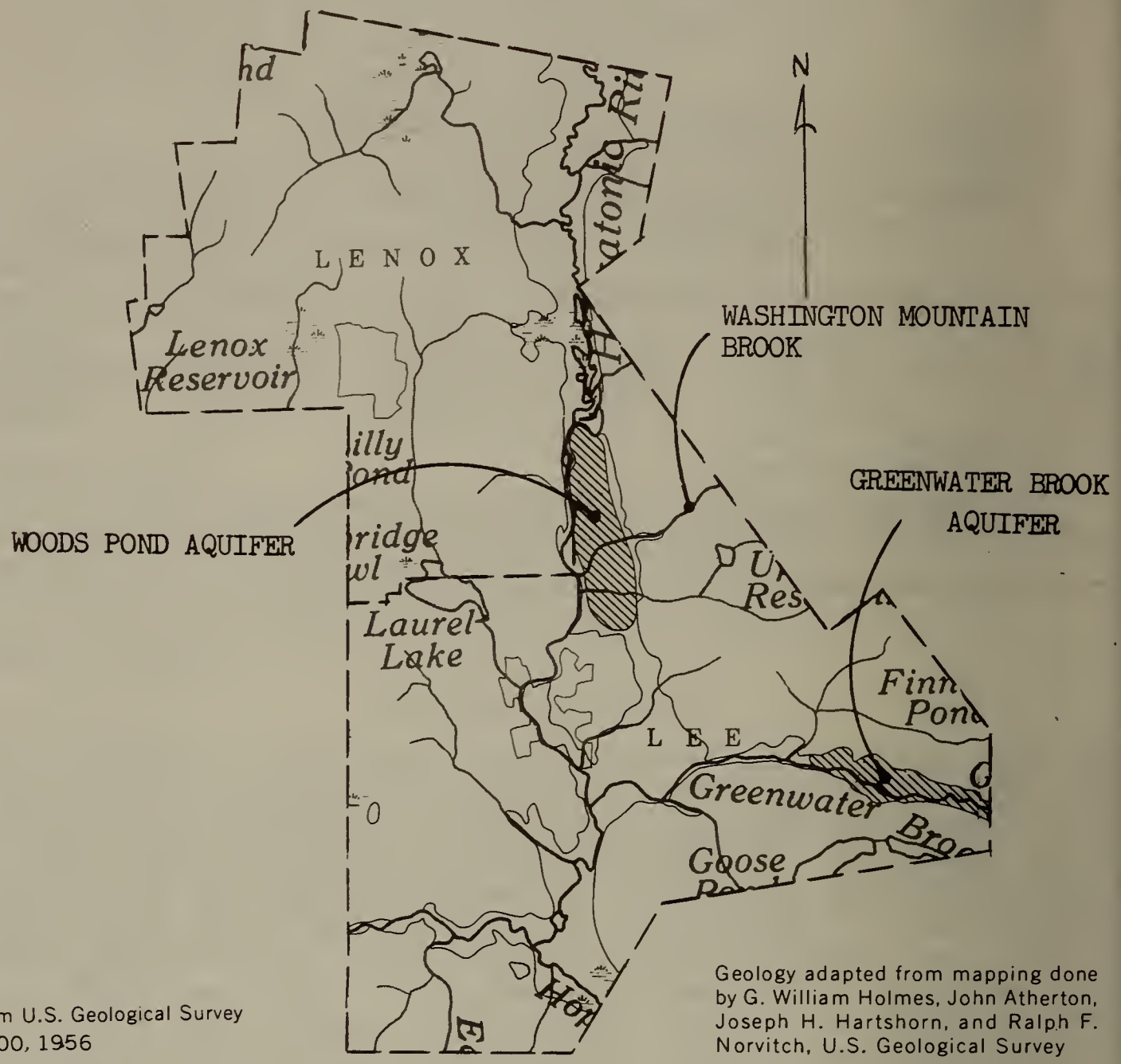
2/ Commercial usage is estimated to be approximately 10 percent of permanent population usage plus additional summer population consumption.

Ground Water Sources

Two areas within the town of Lee have been identified as potential ground water sources. The two areas were identified on the ground water favorability map of the Housatonic River Basin prepared by the U.S. Geological Survey, dated 1966. A portion of this map, covering the towns of Lee and Lenox is presented as Figure 26. In addition and prior to the USGS work, a report entitled "Investigation of Ground Water Condition at Lee, Massachusetts" was prepared in 1965 by Geraghty and Miller, Consulting Ground Water Geologists of Port Washington, New York. Their report dealt only with the "Woods Pond Aquifer." Subsequently a second report entitled, "Ground Water Investigation in the Lee-Lenox Area" was prepared by Ward S. Motts, Geologist at Amherst, Massachusetts, which reviewed the same site. The second area is located along Greenwater Brook.

The potential ground water sites were selected based on the following: geological position, well data, test holes, and base flow data. More recently, material tests and chemical analyses of the water have been conducted.

The Woods Pond aquifer presently supports three wells, operated by the Schweitzer Paper Co., with a combined yield of 2.35 million gallons per day. The Massachusetts Division of Water Resources conducted two well pumping tests of this aquifer in 1979 to better define the potential quantity available. The tests were conducted during the periods of March 26-April 4 and August 8-17, 1979. The conclusion regarding the site pumped was that it could be developed to yield 2 million gallons per day.



Base from U.S. Geological Survey
1:250,000, 1956

Geology adapted from mapping done by G. William Holmes, John Atherton, Joseph H. Hartshorn, and Ralph F. Norvitch, U.S. Geological Survey

FIGURE 26

MAP SHOWING AREAS MOST FAVORABLE FOR THE DEVELOPMENT OF GROUND-WATER SUPPLIES

The site for water supply wells that would tap the Woods Pond aquifer lies directly south of Woods Pond, an impoundment on the Housatonic River. Over the past few years, there have been numerous investigations of the extent of contamination of the Housatonic River with polychlorinated biphenyls (PCBs). The PCBs have apparently accumulated in the sediments on the bottom of Woods Pond. According to a report entitled "PCBs in Housatonic River Sediments," A Progress Report by Charles R. Frink of the Connecticut Agricultural Experiment Station, New Haven, Connecticut, dated July 1, 1980, the total mass of PCBs in the Woods Pond sediments are estimated at approximately 25,000 pounds.

Water quality testing for PCBs in the active wells in this aquifer were conducted in 1977 and 1978. Samples taken on March 9, 1977, of Sweitzer wells #3 and #4, were tested by the Massachusetts Department of Environmental Quality Engineering and revealed 0.5 parts per million (ppm) and 0.9 ppm respectively. (These concentrations were reported as Aroclor 1260). Samples taken on August 26, 1977 from Sweitzer wells #2, #3 and #4, when tested showed concentrations of 4.8 ppb (billion), 2.0 ppb and 2.7 ppb. (These concentrations were reported as Aroclor 1254.) See Appendix B for test results. On April 11, 1978 Dr. I.C.T. Nisbet and others obtained a sample from Sweitzer well #3 and other sources in Lenox. In his final report (see Appendix B), Dr. Nisbet reported concentrations of 1.0 parts per trillion. (Matched to Aroclor 1254/1248 mixture.) Results of water quality analyses of a sample taken in March 1979, did not disclose the presence of PCBs.

To date, the results of all sampling and analyses are, at best, inconclusive as to the presence of PCBs, or the risk involved in further developing of the aquifer. This situation prompted a letter dated December 29, 1980 from Mr. Angelo Iantosca, Regional Environmental Engineer for the Western Region, Massachusetts Department of Environmental Quality Engineering, who states "... it is the opinion of this Department that the possibility exists of contamination by PCB and other chemicals to the ground water sources located near the Housatonic River. Therefore, we suggest that plans for development of these ground water sources be put aside and strongly urge that you proceed with the Washington Mountain Brook project."

In addition to the PCB risk, there is also a risk of other types of pollution. The Housatonic River upstream of Woods Pond receives discharges from industrial treatment facilities at the Crane Paper Co. in Dalton, multiple discharges from the General Electric Co. in Pittsfield and the sewage treatment plants serving Lenox Center, Lenoxdale and Pittsfield.

The water from the Woods Pond aquifer has a hardness of about 170 ppm; which is considered to be "very hard." Considering that the existing town of Lee surface supply has a hardness in the range of 10-20 ppm, it is obvious that treatment (softening) of the hard water from the Woods Pond aquifer to reduce its hardness to a level compatible with the surface supply would be required.

The Greenwater Brook aquifer is not as extensive as the Woods Pond aquifer and cannot be expected to yield the quantities of water available from the Woods Pond area. The town of Lee's consulting firm, with assistance from

the USGS, reviewed available data on the Greenwater Brook aquifer. This review led to the determination of the most probable locations in which to drill test holes for evaluation. Small diameter test wells have recently been drilled and briefly pumped. Subject to further test pumping, however, the Greenwater Brook aquifer, although limited in extent, has been assumed to be capable of supplying the necessary quality of water to warrant review as a water supply alternative for Lee and Lenox, and specifically Lee alone.

Analyses of water from the Greenwater Brook aquifer indicated hardness levels of about 200 ppm, a hard water. As in the case of the Woods Pond source, this water would definitely require softening.

Sodium concentrations of 21 ppm were found in the Greenwater Brook aquifer. These sodium levels are probably caused by deicing operations along U.S. Route 20 and the Massachusetts turnpike. It is the present policy of the Massachusetts Department of Environmental Engineering to refuse approval of a potential water supply source with sodium concentrations higher than 20 ppm if a feasible alternative source is available.

Surface Water Sources

Several new impoundment sites have been investigated independently by the town of Lenox, and with joint considerations, by the town of Lee. These investigations are summarized in Appendix E.

The quantity of water available from surface sources was determined from storage and drainage area data.

The water quality of surface sources evaluated has been assumed to be potable, with disinfection through chlorination. Two water characteristics which may require treatment are turbidity and color. While there is a standard for turbidity, there is none for color; only local aesthetic considerations or tolerance levels. The assumptions regarding required treatment are based on existing surface water supplies, and watershed areas in the Housatonic River valley. Since turbidity and color are somewhat the product of the hydrologic response of the watershed, their levels cannot be wholly predicted. Therefore, the Massachusetts DEQE, Division of Water Supply will approve development of surface water supplies, with treatment needs determined after filling and monitoring of the reservoir.

Recreation Problems

The Massachusetts Department of Environmental Management (formerly DNR) in its 1973 Massachusetts Outdoor Recreation Plan noted that there are 84 impoundments and great ponds in Berkshire County. Standing surface water area totals 7,791 acres. Several of these impoundments are used for water supplies, while the shoreline of others is wholly or predominately privately owned. Where public access has not been acquired, the present development and/or ownership of the shoreline restricts (not necessarily prohibits) recreational use of several impoundments. Of these 84 impoundments, it is estimated that 40 of these are other than natural ponds. Where public access

to water-based recreational areas is available, facilities are often overcrowded. There is an increasing demand for water-based recreational facilities in the area due to an ever-growing population and more leisure. The Department of Environmental Management has projected rapidly increasing demands for swimming, picnicking, camping, and boating in Berkshire County. Except for camping, the demands of these recreational activities currently exceed the capacity of the available facilities. The Department of Environmental Management has proposed expanding existing recreational facilities in central and southern Berkshire County to meet some of the increasing demands for recreational space.

The 1976 Statewide Comprehensive Outdoor Recreation Plan, prepared by the Massachusetts Department of Environmental Management (DEM), stated that in 1975, 89.8 percent of the fishing demand was being met within Region 1 (Berkshire County). This translates to needs estimated to be 1,500 acres of standing water or 200 miles of stream or any combination of lakes and streams to satisfy a need of about 100,000 annual activity days. By 1990 the need was projected to rise to about 330,000 activity days annually.

In February 1978, a Draft 1978 Statewide Comprehensive Outdoor Recreation Plan (1978 SCORP) was circulated. This document was also prepared by the Massachusetts Department of Environmental Management. In the 1978 SCORP the fishing demand for Region 1 for 1977 is given as 1,551,063 activity days. The present capacity is listed as 2,708,116.

This capacity figure is an apparent error and a more realistic value would be about 1,000,000 activity days. (See Appendix C, page C-8). The current unmet demand is about 500,000 activity days.

RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

The planned project is compatible with the present and future planned uses of the land, water and natural resources of the Washington Mountain Brook Watershed and October Mountain State Forest.

The project has been discussed and in various stages of planning for over 15 years, and therefore is an integral part of local, regional, and state resource development and management plans.

National, state and local objectives of reducing the present level of flood damages are served by the planned project. The stated need for additional water-based recreational opportunities, primarily fishing, is also augmented. The municipal water supply benefits are nearly a foregone conclusion in the Berkshire County Regional Planning Commissions Regional Plan for Water Supply and Sewerage, Berkshire County, Massachusetts. The control of erosion and sedimentation of streams (pollutant) is a national goal strongly supported at the regional level which is also a primary objective of the planned project.

The planned project does not conflict with the Massachusetts Department of Food and Agriculture's stated policy of preserving prime agriculture land, or with the recommended water supply management policy of the Massachusetts Executive Office of Environmental Affairs.

ENVIRONMENTAL IMPACT

General

Implementation of the sponsors' selected plan for the Washington Mountain Brook Watershed will have significant environmental impacts. Although the impacts of the project are intended to be strictly desirable, some impacts which cannot be avoided will be adverse. However, most potential adverse impacts can be minimized or mitigated through careful planning and strict enforcement of regulations designed to protect environmental quality.

The environmental impacts of implementing the planned project are detailed in this section. Impacts have been objectively identified and include: short-term and long-term effects; and primary and secondary effects. The environmental impacts are related to the present environment of the watershed, or where appropriate, the future environment of the watershed (year 2000).

The following environmental parameters and resource problem areas were selected to evaluate environmental impacts of the planned project:

Air Quality and Noise Levels
Surface Water Resources
Water Supply
Floodwater and Sediment Damages
Land Use
Plant and Animal Resources
Recreation
Archaeological, Historical and Unique Scenic Resources

Environmental impacts are discussed in relation to the planned project components of conservation land treatment and structural measures. In addition, overall effects which are not specific to these components are discussed under an Economic and Social heading.

Conservation Land Treatment

Although land treatment is generally considered to result in favorable environmental impacts, conflicts in resource use may create situations that might induce adverse effects. An example is the conflict between timber production and wildlife habitat. In this case the adverse effects occur during the harvesting of timber, and the habitat is changed. The effects, however, are minimal and of short duration.

The hydrologic cultural operations and skid trail and logging road erosion control measures will be implemented and maintained by the Massachusetts Division of Forests and Parks, independent of completing the entire planned project.

The cultural operations will improve the hydrologic conditions on about 600 acres of forest land. These operations will have the combined effect of maximizing production of timber and protection of ground litter humus and forest cover. The induced impact will be on wildlife. Habitat will be disrupted temporarily for some species or locally removed for others. While for still others, the habitat will be slightly improved. In all cases, the impact will be minor and of relatively short duration, while disrupting about 12 percent of the forest land.

The skid trail/logging road erosion control measures on 2 miles of roads will control erosion from about 80 acres. Some eroding areas will be seeded. Soil loss from eroding areas will be reduced as will sedimentation of streams, although this is a negligible portion of the total sediment volume.

Structural Measures

Air Quality and Noise Levels

Air quality in the watershed is excellent and generally free of unnatural sounds. Air quality will be slightly degraded by the use of construction equipment at the various construction sites. This reduction in air quality will be temporary, resulting from the generation of exhaust fumes, dust and noise.

Construction policy requires that dust be kept within tolerable limits on access roads and at construction sites by applying water or other dust suppressors.

Air quality will also be degraded from increased recreational traffic in the watershed. The two lakes will average 18,840 user days per year as follows:

Washington Mountain Lake	13,440 user days
October Mountain Lake	5,400 user days

Based upon a 183-day recreational season, this 18,840 user days is equivalent to 103 visitors per day. Using an average of two persons per vehicle (an appropriate average for anglers), this increased use is equivalent to 52 more vehicles per day in the watershed. These vehicles will congregate in the vicinity of the two recreation lakes and along access roads to the lakes. The vehicles will generate exhaust fumes, noise and dust. Exhaust fumes and noise will be generated by gasoline-powered boat engines. Because the watershed is not subject to extended air stagnation, the effects of increased air pollutants from increased recreational use will be minimal, but long-term.

Surface Water Resources

Washington Mountain Brook Watershed currently contains one permanent body of water, Finerty Pond (25 acres) and about 12.3 miles of stream. Water quality within the watershed is generally good.

During construction of the planned impoundment structures there is a potential for a short-term increase in the sediment transported in Washington Mountain Brook. The severity of the impact will depend upon the intensity and duration of rainstorms that occur during construction, and the effectiveness of the erosion and pollution control methods cited on page 14. The 2-acre maximum exposed area limitation should minimize erosion on each site.

Relocation of the utility line in the floodwater pool of the Washington Mountain Lake site would expose areas to accelerated erosion. However, the affected areas are isolated due to the presence of the floodwater structure, and resulting sediment can be effectively controlled onsite.

Installation of the channel work of the planned project will cause a temporary but significant increase in the sediment transported in the lower portion of Washington Mountain Brook. Alteration of the channel slope, size and appearance for about 600 feet would result. The sequence of construction would move in a downstream direction to provide for removal of any construction related sedimentation or other deposition. The impact from increased sedimentation might be the deposition of channel bars and partial filling of stream pools. Biologic impacts might include: destruction of exposed benthic organisms by abrasion, disruption of the thermal regime, reduction of the concentration of dissolved oxygen, reduction of light penetration and primary production, and interference with the respiration, feeding and reproduction of resident species.

Subsequent to implementation of the watershed plan components is installation of the water supply pipeline. This supply line is to follow Washington Mountain Road (County Road) for a distance of about 2.2 miles, closely paralleling the stream throughout. A potential significant impact could result from erosion and sedimentation. Pipeline crossings to serve Lenox will be attached to existing bridge structures with no impact at the streams anticipated. Sedimentation from this work would affect the most productive section of the brook and could jeopardize recruitment stocks of various aquatic species.

After planned structural measures have been completed, there will be about 55 percent annual reduction in sediment delivered to the alluvial fan on Washington Mountain Brook, and erosion from the watershed will be reduced. Sediment will accumulate in each of the lakes, and the structures have been designed to accommodate this material without jeopardizing their other uses. The impoundments, which will control flow from 65 percent of the watershed, will accumulate an average annual sediment load of 27,400 cubic feet. This sediment will be prevented from flowing further downstream and creating problems in the lower portion of the watershed. In addition, the ability to moderate high flows will significantly reduce streambank erosion promoted by flood flows in the central and lower portions of the watershed. The average volume of sediment reaching the Housatonic River each year will be reduced from about 5000 cy to 2200 cy. These impacts will be primary and long-term.

Table 18 is a comparative summary of present (1977) and future (with completed planned project) peak discharges for several frequency floods.

The sediment control facilities will significantly reduce the volume of sediment delivered and deposited in Reaches 1 and 2. Periodic removal of accumulations will be localized and a minimum of stream regime will be disrupted.

Water quality of Washington Mountain Brook (chemical and organic parameters) will essentially remain unchanged. It is expected that the total coliform levels will be reduced through water supply management activities and the inundation of the wetlands at October Mountain and Schoolhouse Lake sites.

TABLE 18

FREQUENCY-DISCHARGE COMPARATIVE SUMMARY

Frequency		Peak Discharge					
Exceedence Probability	Recurrence Interval Years	Reach 1		Reach 2		Reach 3	
		Present	With Project	Present	With Project	Present	With Project
.20	5	1350	750	1270	700	1170	500
.10	10	1870	1040	1760	970	1610	700
.04	25	2300	1280	2170	1200	1980	860
.02	50	2580	1440	2420	1350	2220	960
.01	100	3120	1750	2940	1640	2690	1170

Eutrophication will not be a problem in the planned lakes (EcolSciences). Results of a trophic state model applied to the planned lakes are included in Appendix D. Based upon present land use in the drainage basins of the lakes, the model projects that the trophic status of Schoolhouse Lake will be oligotrophic but will approach mesotrophic. October Mountain Lake and Washington Mountain Lake will be oligotrophic. These trophic states result from the low nutrient export from forested areas and the flushing characteristics of the lakes.

Since a final facilities plan has not been developed, the eutrophication projections do not reflect possible pollutant loads from parking areas, or waste-holding facilities, etc. Since runoff from these sources could have a significant effect upon the trophic status of October Mountain Lake, this realization and resource data, such as the soil survey, must be considered in the final planning and design of these areas.

Based upon the results of the model, nutrient loading of the lakes will not reduce their value for recreation or for water supply. Recreational activities on the lakes may introduce other pollutants such as petroleum derivatives, heavy metals, coliform bacteria and solid refuse. English, McDermott, and Henderson (1968) demonstrated that water exposed to outboard motor exhaust received an average of 105g of nonvolatile oil, 57g of volatile oil, 0.53g of lead, 0.60g of phenols, 432g of COD, and 160g of ultimate BOD from each gallon of gasoline consumed. These pollutants were slightly toxic and imparted an objectionable taste to test fish. The pollutants were demonstrated to accumulate in direct proportion to engine use. These impacts can be minimized through proper management and appropriate use of the lakes.

Water Supply

Completion of the planned project will directly benefit the towns of Lee and Lenox by increasing the safe yield of the present supply system. The storage capacity of the Washington Mountain Brook Watershed will be increased by 400 million gallons and this will in turn permit the town of Lee to abandon the present water intake on Washington Mountain Brook. Although the source is the same, the storage system will provide a safe yield of 2.45 mgd and a higher quality of water compared to the low pressure intake system. This will be a primary and long-term impact.

Water will be withdrawn from Schoolhouse Lake on a daily basis. Water will normally be withdrawn from October Mountain Lake from December through March of each year, thereby providing lag time between the normal recreation season and withdrawal period. Summer recreational activity on the lake will not adversely effect the quality of the water supply since treatment will be provided. However, since the reservoir is a water supply, water quality will be monitored regularly by appropriate enforcement authorities. Use of internal combustion engines will be prohibited on October Mountain Lake to eliminate potential adverse effects.

Floodwater and Sediment Damages

Completion of the planned project would have a long-term impact on floodwater and sediment damages. The two additional impoundment structures have been designed to automatically accommodate flows resulting from a 100-year storm, with 927 acre-feet of storage allocated to flood control. With 65 percent of the watershed controlled, (3,745 acres) and the channel work installed, the 100-year damage area of 40 acres shown on Figure 25, and the total area (94 acres) of the alluvial fan, which is presently subject to flooding from Washington Mountain Brook, will be reduced to 12 acres for the 100-year flood. In Reaches 1 and 2 the flows from a 100-year flood will be confined to the channel for about 3,100 of the 4,000 feet. No overtopping of road bridges within these reaches would occur from the 100-year or more frequent floods. Direct monetary benefits will be $71,170 annually. Indirect annual benefits are estimated to be $11,610. The average volume of sediment removed on an annual basis will be reduced from about 4,100 cubic yards to 1,800 cubic yards; and following a 100-year flood, from about 26,000 cubic yards to 7,600 cubic yards. Removing this material from the sediment control facilities rather than dredging the stream is valued at $2.00 per cubic yard. Only

minimal disruption of the stream regime in the lower reaches is anticipated. The annual monetary benefit for sediment control is estimated at $17,660.

The effect of the project on flooding along the Housatonic River is minimal. During major regional floods the project will not have a measurable effect on peak flood stages along the Housatonic River. The reduction of peak flood flows from the Washington Mountain Brook Watershed, which normally occur shortly after the storm, can provide additional time to accomplish temporary flood proofing of structures or evacuation prior to the main stem peak. This time can range from 6-24 hours for certain storm conditions. The delayed and prolonged discharge from the structures will not contribute to any flooding on the Housatonic River. The total flow from the structures for the 100-year flood is only 240 cfs. No monetary benefits have been attributed to this impact.

A potential impact is related to Washington Mountain Road (County Road) through Reach 3. This road has been abandoned for a distance of over 2 miles due to the futility of maintenance in light of the constant threat and recurrence of severe flood damage. The reduction of flood flows through the reach could influence future decisions regarding the status of this road.

Land Use

The current land use within the watershed will be altered by completion of the planned project. Approximately 298 acres of open water, 55 acres of wetlands, 30 acres of grassland and 8 acres of rock riprap (embankment slopes) will replace 129 acres of forest land, 65 acres of wetland, 4 acres of borrow area, and 193 acres of cleared forest land. See Table 19 for a detail accounting of land use changes. The monetary value of the lost forest land was considered a land rights cost and estimated to be $24,350. Value of the wetland is considered under Plant and Animal Resources.

Soils which occur within the areas affected by the planned project do not presently support nor are they capable of supporting commercial agricultural crop production. None of the land present meets the USDA criteria for prime agricultural land. Stoniness, wetness and steep slopes are the principal limiting features of these soils.

A potential impact concerns the developed flood plain along the lower reaches of Washington Mountain Brook. Completion of the planned project would have the effect of reducing the area subject to flooding from a 100-year flood from about 40 acres to 12 acres.

Plant and Animal Resources

Installation of the structures will change the land use and thereby change associated wildlife habitat on approximately 391 acres of land. About 65 acres of wetland habitat, 129 acres of forest habitat and 4 acres of existing borrow area and 193 acres of cleared forest, will be replaced by the permanent pools, associated structures and borrow and disposal

TABLE 19

SUMMARY OF LAND USE CHANGES

Land Use	Acres Permanently Lost[1/]				Acres Temporarily Lost[2/]				Acres Gained				Summary of Watershed Changes			
	WML[3/]	OML[4/]	SHL[5/]	TOTAL	WML	OML	SHL	TOTAL	WML	OML	SHL	TOTAL	Acres Net[6/] Change	Total Acres Present	Total Acres With Project	Percent Change
Forest land	0	81	48	129	19	6	16	41	0	0	0	0	-129	4,945	4,816	-2.7
Borrow Area	0	0	4	4	0	0	0	0	0	0	0	0	-4	4	0	-100.0
Cleared Land	193	0	0	193	0	0	0	0	0	0	0	0	-193	193	0	-100.0
Grassland	0	0	0	0	0	0	0	0	0	9	21	30	+30	54	84	+55.6
Rock Riprap	0	0	0	0	0	0	0	0	0	7	1	8	+8	4	12	+200.0
Open Water	0	0	0	0	0	0	0	0	169	90	39	298	+298	25	323	+1192.0
Seasonally Flooded (Type 1)	0	2	3	5	0	0	0	0	0	0	0	0	-5	5	0	-100.0
Fresh Meadow (Type 2)	20	2	6	28	0	0	0	0	6[8/]	0	0	0	-22	73	51	-30.1
Shallow Marsh (Type 3)	11	0	7/	11	0	0	0	0	6[8/]	0	0	0	-5	24	19	-20.8
Deep Marsh (Type 4)	0	0	0	0	0	0	0	0	6[8/]	0	0	0	+6	9	15	+66.7
Fresh Open Water (Type 5)	0	5	0	5	0	0	0	0	37	0	0	0	+32	15	47	+213.3
Shrub Swamp (Type 6)	0	8	0	8	0	0	0	0	0	0	0	0	-8	19	11	-42.1
Wooded Swamp (Type 7)	0	8	0	8	0	0	0	0	0	0	0	0	-8	120	112	-6.7
TOTAL	224	106	61	391	19	6	16	41	224	106	61	391	--	--	--	--

1/Includes dam, emergency spillway, disposal areas, permanent pool, and water level control channel.

2/Includes flood control pool only.

3/ The Washington Mountain Lake (WML) dam was completed in 1973. The planned recreation lake area of 224 acres was previously committed and cleared in 1976. Completion of the planned project would result in the permanent inundation of the 224 acres.

4/October Mountain Lake.

5/Schoolhouse Lake.

6/Does not include land temporarily lost or expected wetland changes due to increased beaver activity.

7/Less than 0.5 acre gain or loss.

8/Will develop through plant succession in shallow portions of the permanent pool.

areas. An additional 41 acres of forest land will be impaired or temporarily lost due to occasional storage of floodwater. About 34 acres of forest land and the 4 acres of existing borrow area will be changed to 30 acres of grassland (grass-legume vegetative cover) and 8 acres of rock riprap which are the protective covers provided on the dams, emergency spillways, water level control channel, and borrow and disposal areas.

Wetlands will be decreased in the watershed as a result of the new impoundment structures (see Table 19). Of the approximately 265 acres of wetland in the Washington Mountain Brook Watershed, 65 of the existing acres or 25 percent would be converted to open water in reservoirs. This wetland occurs in active and inactive beaver flowages. The 224-acre body of water at Washington Mountain Lake will contain about 55 acres of wetland types similar to those areas impacted. The net result is a loss of 10 acres. The wetland in the watershed with the planned project installed as tabulated in Table 19 is shown in Figure 27. Their suitability for wildlife habitat was discussed on pages 47-49. In the Upper Housatonic River Basin[1/] there are approximately 11,669 acres of wetland consisting of Types 1, 2, 3, 4, 6, and 8.[2/] There are also approximately 10,284 acres of wooded swamp wetland (Type 7).[3/] The loss of 57 acres of Types 1, 2, 3, 5, and 6 wetland in the Washington Mountain Brook Watershed represents less than 0.5 percent of the present total.

Conversion of present marsh and swamp acreage to open water pond acreage can be expected to result in a decrease of nuisance insects, primarily mosquitoes, in the immediate area. Based on topography and distance to existing wetlands, this reduction would be most noticeable at the Washington Mountain Lake site. Both the Schoolhouse and October Mountain Lake sites are in close proximity to other existing wetland acreage where a decrease in mosquito activity would not be as obvious. Some states have conducted impoundment development programs on problem mosquito areas as a successful means of mosquito control (Shoemaker, 1966; Catta and Lesser, 1963).

Washington Mountain Brook supports a low population of native brook trout. Most trout streams of this size support about 25 pounds of trout per mile. Washington Mountain Brook supports about 5 pounds of trout per mile in its best reaches. Shallow, abandoned beaver flowages, low water pH and occasional extreme low flow conditions in the upper reaches apparently limit trout establishment and distribution.

Installation of the remaining structures will result in a reduction of approximately 5,400 feet of perennial stream and about 1,500 feet of intermittent streams and their associated aquatic habitat. This loss is

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1/ Based on information provided by William P. MacConnell, et al., Remote Sensing 20 Years of Change, Massachusetts Agricultural Experiment Station, University of Massachusetts at Amherst, 1974.

2/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

3/ Water and Related Land Resources of the Berkshire Region, Massachusetts, U.S. Department of Agriculture, 1977.

the length of streams within the planned impoundments. An additional 300 feet of intermittent stream and 300 feet of perennial stream will be occasionally inundated by the temporary storage of floodwater.

The impoundment structures are designed to provide bottom releases. This release of colder water from the lower levels of the permanent pools is expected to avoid increases in downstream water temperature during summer months and maintain flows at or above the lowest 7-day annual low flow volume. This minimum 7-day flow has been estimated to be about 0.23 csm for the watershed. The combined release from the three impoundments during a drought is expected to be at least 1.5 cfs or an average of 0.26 csm from the controlled drainage area. The annual stream flow will be reduced by the amount of water withdrawn for water supply. This eventually will reach 2.45 million gallons per day for an average year.

No significant sport fishery will be affected by the construction of the dams and filling of the impoundments. The downstream channel work in the urbanized area will result in short-term, significant reduction of benthic organisms and a moderate reduction of habitat quality for native trout.

The 224-acre and 90-acre permanent pools which would be created are expected to support a self-sustaining warm water fishery. The 224-acre and 90-acre pools will also be stocked annually with trout by the Massachusetts Division of Fisheries and Wildlife. Although some carryover is expected from one year to the next, the quality of fishing for trout will be dependent upon stocking since natural reproduction is unlikely.

The value of land on which use was changed due to implementation of the planned project for recreation was considered a land rights cost and estimated at $32,550.

Relocation of the utility-line will not have a significant impact on plant communities or wildlife. The area of concern is within the planned 224-acre Washington Mountain Lake.

Subsequent installation of the pipeline will have only a minimal impact on wildlife. One to 1.5 acres of forest land will be converted and maintained as grassland providing an edge habitat for wildlife.

Recreation

Completion of the project will enhance the water-based recreational potential of the watershed and October Mountain State Forest. The planned impoundments would provide 314 acres of combined cold-warm-water fishery. Monetary benefits attributed to these fisheries is estimated to be $94,860 annually, representing 18,840 user-days. This satisfies approximately 20 percent of the estimated present need (100,000, 1976 SCORP,DEM) in Berkshire County. Waterfowl hunting and furbearer trapping will be enhanced, although not significantly. These will be long-term impacts.

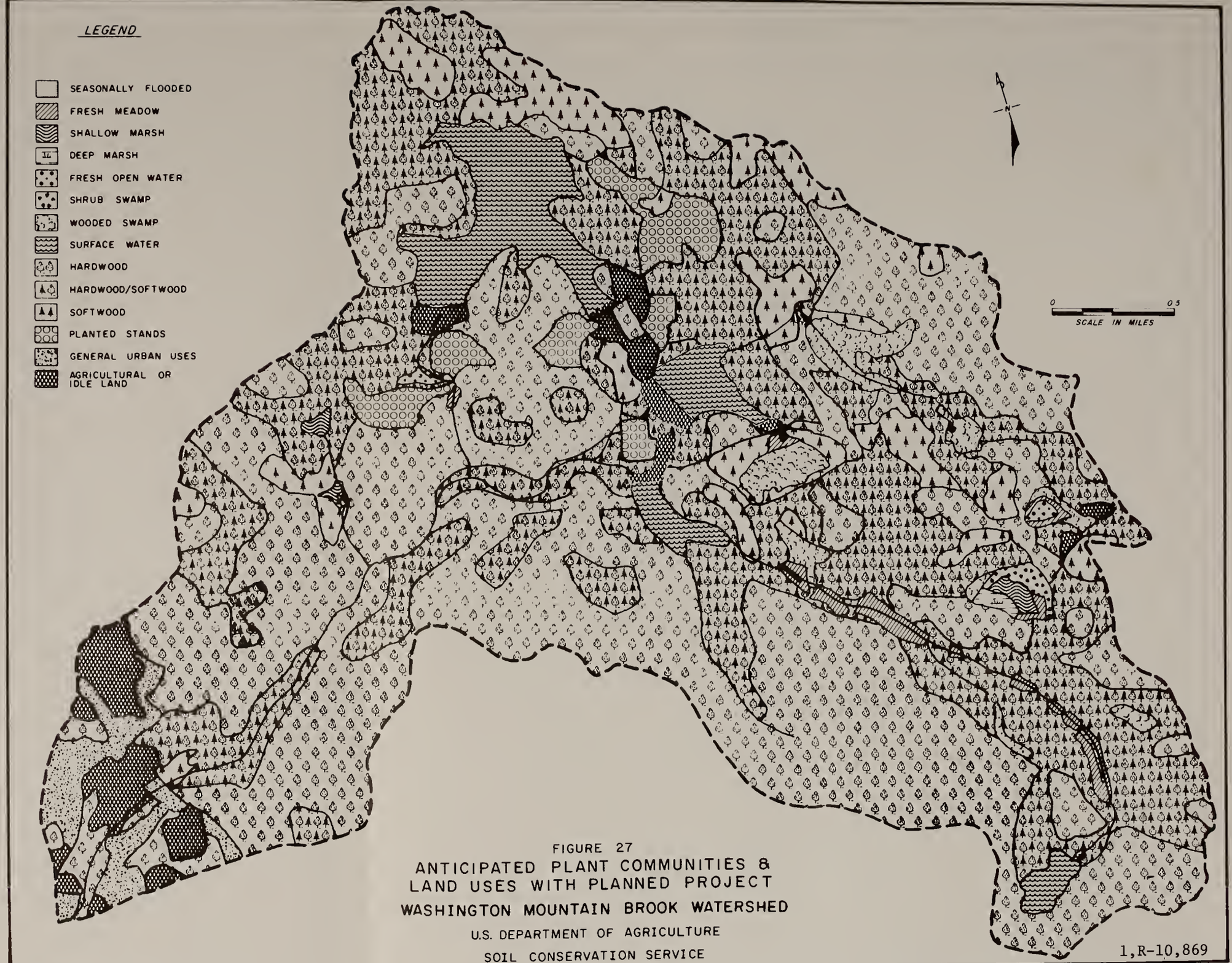

FIGURE 27

ANTICIPATED PLANT COMMUNITIES & LAND USES WITH PLANNED PROJECT

WASHINGTON MOUNTAIN BROOK WATERSHED

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

1,R-10,869

USDA-SCS LANHAM, MD 1979

Boating potential (see Appendix D) will be enhanced in the watershed by the provision of 314 acres of surface area. A decision concerning the type of boating to be permitted on the lakes will be made by the Division of Forests and Parks. Use of internal combustion engines has been prohibited on October Mountain Lake by the Lee Board of Health.

Hiking will be enhanced by the presence of existing trails and additional cleared areas used as construction access routes. The Massachusetts Department of Environmental Management has recommended that circumferential hiking trails be provided around the proposed lakes. Informal hiking opportunities can be provided without additional clearing. Existing trails, logging roads and utility corridors could also be improved with markers and trail maps to promote additional use.

Restrictions which presently prohibit public use of Finerty Pond (25 acres surface area) will be removed, and control of the pond and its watershed will be assigned to DEM.

Public use of the recreation pools will primarily consist of fishing. Fisherman do not require or demand pest control. Pesticide application is not expected to occur.

Archaeological, Historical and Unique Scenic Resources

Completion of the project with the increased public use of the watershed, may subject several historical sites to increased vandalism and looting. One site consisting of house and barn cellar holes is near the common borrow area for construction of Schoolhouse Lake and October Mountain Lake. It is vulnerable to damage during construction, but will be protected by fencing if necessary. The remaining sites that were identified are not directly endangered by installation of the remaining planned project measures.

No unique scenic resources will be impacted by completion of the planned project. In general, visual resources in the watershed will be improved through increased diversity of land use.

The addition of permanent open water will contribute to improved scenic resources in the watershed, as a result of the increased shoreline (water edge) and water area, (Zube, E.H., D.G. Pitt and T.W. Anderson, 1974, Perception and Measurement of Scenic Resources in the Southern Connecticut River Valley. Institute for Man and His Environment, Publication No. R-74-1, University of Massachusetts, Amherst, Massachusetts).

Studies of the visual preferences of townspeople in the towns of Lee and Lenox (Natural Resources Planning Program, SCS, 1975) showed a high preference for bodies of open water and vistas of forested mountain or hilly terrain. Water bodies bordered by woodland were of particularly high preference.

Economic and Social

The effect of the planned project on the economy of the area would be moderate. Flood prevention-sediment control and water supply benefits would

be the primary stimulus while recreational benefits will only provide a minimal stimulus. The loss of current use of lands replaced by the dams and reservoir areas would have little economic significance. Overall, land values will not be measurably altered and flood plain encroachment is not expected. The increase in the safe yield of the water supply system should allow for continued projected, controlled growth within the towns of Lee and Lenox.

Of the approximately 3.0 million dollars to be expended initially for construction of the planned structural measures, approximately 25 percent or about three-quarters of a million dollars will be for local labor and materials. (Local is defined here as constituting the Pittsfield SMSA, which include the towns of Lee and Lenox.)

Traffic disruptions along Mill Street, Washington Mountain Road and Woodland Street during installation of the channel work will be minor, and will have a negligible effect on a townwide (Lee) basis.

The economic effects from operation and maintenance of project measures varies. A total of less than 1 man-year of employment will be required. Materials such as lime, fertilizer, seed, and machinery needed for operation and maintenance of structures will not require a significant expenditure. The operation and maintenance of the sediment control facilities will provide a significant source of fill material (gravel, cobbles, boulders) to the town of Lee.

Average annual flood prevention and sediment control benefits that will result from the land treatment and structural measures are estimated to be $82,780. The average annual water supply benefits are estimated to be $647,900. The average annual recreational benefits are estimated to be $94,860.

In addition to monetary benefits from the project measures, the project will tend to improve public health, increase employment security, lessen hazards to life and property, provide a sense of stability of the communities and contribute to maintaining and improving the quality of the environment.

Economic benefits foregone by direct beneficiaries for a 1-year delay of the project will depend primarily on flood losses incurred during the delay period and are unpredictable. However, if the September 1938 flood were to recur during the delay, it would cause damages of about $570,000 along Washington Mountain Brook. Based on past experience, it is expected that a 1-year delay of the project would result in an increased installation cost of 5 to 8 percent.

An economic summary of findings is shown in Appendix A.

Summary - Favorable Environmental Effects

The following are environmental effects which are probably beneficial.

- For floods of a 100-year frequency or less there will be a reduction of average annual floodwater damages along Washington Mountain Brook of 93 percent or $82,780. Protection is provided for roads, four bridges, 12 houses and a mobile home park with 10 trailers.

- Reduction of the area subject to flooding from a 100-year flood from about 40 acres to 12 acres.

- Reduction of erosion from streambanks upstream of the urbanized area resulting from lowered peak flows following storms.

- Creation of a 90-acre pool and a 224-acre pool which will support a combination cold-warm water fishery. Total increase of 314 acres of open water aquatic habitat.

- Within the 224-acre pool will be 55 acres of wetlands consisting of Type 2 through Type 5.

- An increase of 2.45 mgd in the safe yield of the municipal water supply for the towns of Lee and Lenox, valued at $647,900 per year.

- Conversion of 26 acres of existing woodland and 4 acres of existing borrow area to grass-legume vegetative cover which will benefit wildlife by increasing the diversity of vegetative cover in this largely (88 percent) wooded watershed. This conversion will also create valuable woodland-openland edge which will primarily benefit woodland species of wildlife.

- Creation of 314 acres of open water which will provide 18,840 fishing activity days annually for public use, valued at $94,860.

- Improvement in the visual resources in the watershed through the increased diversity of land use. Permanent open water is a valuable component of a landscape and the net aesthetics of an area.

- Beaver will be allowed to reoccupy suitable habitat.

- Reduction of average annual sediment removed from alluvial fan (4,100 cubic yards) by about 57 percent. Controlled annual deposition of 1,800 cubic yards in sediment control facilities maintains capacity of channel and bridges.

Summary - Adverse Environmental Effects

The following are environmental effects which are probably adverse and cannot be avoided.

- Reduction of: 5 acres of Type 1 wetland, 28 acres of Type 2 wetland, 11 acres of Type 3 wetland, 5 acres of Type 5 wetland, 8 acres of Type 6 wetland, and 8 acres of Type 7 wetland. This loss of wetland acreage and associated wetland wildlife habitat will result from conversion to permanent pool areas.

- Reduction of 129 acres of forest resource and associated woodland wildlife habitat will result from land cleared and used for the dams, spillways, borrow areas, permanent pools, dike and water level control channel.

- Occasional temporary loss of 41 acres of forest resource and associated wildlife habitat will result from floodwater storage.

- Loss of 5,400 feet of natural perennial stream habitat and 1,500 feet of natural intermittent stream habitat will result from the dams and permanent pools.

- Occasional temporary loss of 300 feet of intermittent stream and 300 feet of perennial stream habitat will result from floodwater storage.

- Temporary increase of noise, air pollution, erosion and sedimentation during construction.

- Increase in noise, air and water pollution during the project life.

- Reduced quality of aquatic habitat in about 600 feet of perennial stream may result from the channel work.

- Views from certain vantage points will be changed as a result of the dams and appurtenances.

- Several identified archaeological sites may be subject to increased vandalism as a result of project induced use of the watershed.

- Approximately 1 to 1.5 acres of forest resource and associated woodland wildlife habitat will be lost as a result of the town's installation of the water line from October Mountain Lake to Upper Reservoir on Codding Brook.

ALTERNATIVES

General

A brief overview of the planning effort that has gone into this project was given in the introductory section, Summary of the Plan Formulation Process. Much of that discussion is pertinent to the development of alternative plans, and should be reviewed by the reader.

Alternative plans have been considered with particular attention to reasonable alternatives that have been suggested by others and to those actions that might lessen the adverse environmental effects associated with the selected plan.

In doing so, Executive Order 11988 and 11990 have been accommodated. However, where there is no practical alternative, as is the case of this project, further mitigation features have been incorporated into the selected plan (see Planned Project Section).

This section outlines seven alternatives to the selected plan. Within the seven alternatives are a number of components that are included to meet various objectives including flood prevention, municipal water supply, erosion and sediment control, and recreation. The alternatives are comprised of groups of components that logically mesh to meet objectives and that will provide decisionmakers with a range of options to choose from. Each alternative is compared to the selected plan in terms of costs, benefits and other environmental effects.

The availability of the Woods Pond aquifer as an alternative water supply source has been the subject of many meetings, news articles and letters of comment. The Woods Pond aquifer is not a socially acceptable alternative water supply source to the Washington Mountain Brook project. The quality of the water is threatened from several very real sources of pollution. Foremost is the known presence of PCBs in the bottom sediments of Woods Pond, in the greatest concentration known to exist in the Housatonic River Valley. The aquifer is also located downstream from three sewerage treatment facilities, including the regional Pittsfield plant. In addition, two municipal landfills are located in close proximity. In light of these known hazards, the responsible people charged with providing a safe water supply to their communities have elected not to develop the aquifer further since a technically feasible, and cost effective alternative is available to them. For purposes of evaluating the technical feasibility of the Woods Pond aquifer, costs associated with activated carbon beds for adsorption have been added to the treatment process to remove PCBs.

All the known options for water supply development were evaluated by Lee and Lenox. The results and comparisons are given in Appendix E. From these options, the Greenwater Brook aquifer was selected as an alternative that was cost effective and would avoid most of the adverse environmental effects of the selected plan. Only two options were less expensive, both surface water sites with similar environmental impacts, one being the selected plan.

Of all items evaluated by Lee and Lenox, only the selected plan was considered mutually beneficial and offered the opportunity for a regional supply.

Consideration of water conservation has been an integral part of the planning process. The past accomplishments and ongoing water conservation efforts of Lee and Lenox were presented in the Municipal and Industrial Water Supply Problems section. These efforts have enabled both communities to "get-by" while awaiting implementation of this project or an alternative. The remaining reductions in consumption that can be expected from further conservation are not large enough to be considered an alternative course of action. Instead, continued water conservation is implicit in the projected demand figures and is considered to be an integral part of all alternatives.

Conservation land treatment as described in the planned project, is a component of each alternative, including "no project," and the effects would be the same as described.

The town of Lee is expected to continue its participation in the National Flood Insurance Program. Therefore, this is considered a without project condition.

The alternatives are:

Alternative	Description
I.	Single-Purpose Flood Prevention Structures (3), Ground Water Development, Channel Work
II.	Single-Purpose Flood Prevention Structures (2), Multiple-Purpose Flood Prevention and Recreation Structure (1), Ground Water Development, Channel Work
III.	Single-Purpose Flood Prevention Structure (1), Multiple-Purpose Flood Prevention and Recreation Structure (1), Multiple-Purpose Flood Prevention and Water Supply Structure (1), Channel Work
IV.	Single-Purpose Flood Prevention Structure (1), Extensive Channel Work, Ground Water Development
V.	Single-Purpose Flood Prevention Structure (1), Nonstructural, Ground Water Development
VI.*	Multiple-Purpose Flood Prevention and Recreation Structure (1), Multiple-Purpose Flood Prevention, Water Supply and Recreation Structure (1), Multiple-Purpose Flood Prevention and Water Supply Structure (1), Channel Work
VII.	No Project Activity
VIII.	Multiple-Purpose Flood Prevention and Recreation Structures (2), Multiple-Purpose Flood Prevention, Water Supply and Recreation Structure (1), Channel Work

*Selected Plan

Cost and benefit data of the selected plan (Alternative VI) are also presented in Appendix A, to facilitate economic comparisons.

Alternative I

For achieving flood prevention and sediment control this alternative consists of managing the existing Washington Mountain Lake structure only for flood prevention, installing two additional single-purpose flood prevention structures, and channel work.

The single-purpose flood prevention structures would be constructed at the site of the October Mountain Lake and Schoolhouse Lake multiple-purpose structures included in the planned project. The dams would be constructed of compacted earth, with a principal spillway conduit and riser, and vegetated earth emergency spillway. About 278 acre-feet of flood storage would be provided at the October Mountain site, and 649 acre-feet of flood storage at the Schoolhouse site. Only temporary storage for floodwater would be provided within the reservoir areas and normal stream flows would pass unimpeded through the structures. All three structures would operate automatically, similar to the planned project. Channel work identical to the planned project would also be installed. This alternative would provide the same level of flood prevention and sediment control as the planned project.

An additional source of potable municipal water would be provided by a ground water development in the Greenwater Brook aquifer. This component would consist of a well (or wells), pumping facilities, treatment plant, and transmission lines. The ground water development would provide an increase in the safe yield of the town of Lee's water system of 2.45 million gallons daily, which is equivalent to the selected plan.

Improved access to Finerty Pond could be provided. This 25-acre pond could provide about 1,500 annual activity days for fishing, once properly stocked and managed as a warm-water fishery. This represents about 8 percent of the fishing demand satisfied by the planned project.

The loss of land and related resources associated with the permanent pools of the planned project would be avoided. About 30 acres of land would be committed to the construction of the two dams, and emergency spillways. An additional 85 acres would be periodically inundated by stored floodwater behind these structures. The same impacts attributed to the channel work in the planned project would result.

Development of the ground water wells will require land acquisition along Greenwater Brook. The acreage will vary with the number of wells installed, but about 6 acres per well is reasonable, with a minimum of 12 acres for a development. Operation of the wells (pumping) may cause Greenwater Brook to "dry up" about 10 percent of the time. This would most likely occur during the latter part of summer, when demand is high and surface flows are near minimum. This impact will depend on the withdrawal rate and the exact location of the wells.

Backwash water will be treated to remove pollutants prior to discharge to any streams. Solid wastes in the form of grit and sludge, from the treatment plant backwash will be removed at the plant and will be disposed of at an approved sludge disposal site, in accordance with the Massachusetts Department of Environmental Quality Engineering, Divisions of Water Supply and Water Pollution Control.

Pipelines will be installed along existing easements and streets and roads to minimize adverse effects on existing or future land use.

The treatment plant will be given architectural consideration as to location and design to minimize any visual impacts.

The benefits and costs for Alternative I are as follows:

Costs: ($)

	Initial Costs	Average Annual Cost
October Mountain Lake	337,400	13,930
Schoolhouse Lake	826,300	29,800
Channel Work	420,600	14,250
Finerty Pond	17,000	1,810
Ground Water	6,832,700	553,490
Totals	8,434,000	613,280

Benefits: ($)

	Average Annual Benefit
Flood Prevention	82,780
Water Supply	422,210
Recreation	3,375
Total	508,365
Net Average Annual Benefit: Minus	104,915

Alternative II

This alternative would be identical to Alternative I with the following exceptions: Washington Mountain Lake would be filled and operated as planned for flood prevention and recreation (a 224-acre cold-warm water fishery), and the improved access and management of Finerty Pond for recreation use would be deleted.

As with Alternative I, the objectives of the sponsors for flood prevention, sediment control would be met. Washington Mountain Lake would provide 13,440 annual activity days for fishing, which represents about 68 percent of the planned project recreation benefits. Water supply goals would be satisfied.

The expected impacts would be as described in Alternative I, or for the planned project, as appropriate.

The benefits and costs for Alternative II are as follows:

Costs: ($)

	Initial Costs	Average Annual Cost
October Mountain Lake	337,400	13,930
Schoolhouse Lake	826,300	29,800
Channel Work	420,600	14,250
Ground Water	6,832,700	553,490
Washington Mountain Lake	200,000	14,830
Totals	8,617,000	626,300

Benefits: ($)

	Average Annual Benefit
Flood Prevention	82,780
Water Supply	422,210
Recreation	70,560
Total	575,550
Net Average Annual Benefit: Minus	48,050

Alternative III

This alternative maximizes the potential of the multiple-purpose structure at the October Mountain Lake site for municipal water supply in addition to providing storage for flood prevention. Also, Washington Mountain Lake would be completed as detailed for the planned project, as would the channel work. The Schoolhouse Lake site would be developed as a single-purpose flood prevention structure, as in Alternatives I and II.

The October Mountain Lake site would be developed only for flood prevention and municipal water supply. No recreation use (fishing) would be planned. The permanent storage would be utilized for water supply. This complex would provide a safe yield of approximately 1.1 mgd. The 2.4 mile pipeline and impacts would be similar to those described for the selected plan.

This alternative would provide flood prevention and sediment control benefits equal to those of the planned project. Washington Mountain Lake would provide 13,440 annual activity days for fishing or 71 percent of the planned project. October Mountain Lake would increase the safe yield of the present water supply system by about 1.1 mgd or about 45 percent that of the selected plan.

The environmental impacts associated with Washington Mountain Lake, October Mountain Lake, the pipeline and the channel work would be essentially the same as the planned project. The increase in the number of persons expected annually (for recreation) would decrease by about 6,300.

At the Schoolhouse Lake site, there would not be a permanent pool, or the resulting loss of land and related resources as in the planned project. There would be a periodic temporary inundation of about 35 acres by floodwater, and the permanent loss of 18 acres to be occupied by the dam, emergency spillway, disposal areas, etc.

This alternative meets only 45 percent of the water supply needs for Lee and Lenox. The alternative had been presented in the State Environmental Impact Report and the Draft Environmental Impact Statement. The purpose of presenting this alternative was to offer a smaller scale water supply option. Since the decision has been made by Lee and Lenox to identify a mutually agreeable water supply alternative, this alternative is no longer considered reasonable.

Alternative IV

This alternative would consist primarily of channel work, ground water development and management of the Washington Mountain Lake site for flood prevention only.

The development of ground water for municipal water supply and the use of Finerty Pond as a warm-water fishery would be as detailed in Alternative I.

The channel work would supplement the existing floodwater retarding structure, at the Washington Mountain Lake site. The channel work would include construction of a single sediment control facility (capacity about 10,000 cubic yards) above Newton Bridge. The location would be similar to that of the upper sediment control facility detailed for the planned project.

This would be primarily an above ground (streambed) drop structure. There will be no significant impoundment of water. Operation and maintenance would be similar to the planned project, except the annual removal volume would be about 4,100 cubic yards. A reinforced concrete channel would also be constructed from Newton Bridge to the Conrail railroad crossing, a distance of about 4,000 feet. (Concrete is estimated to be less costly than riprap due to the size of riprap required by expected velocities in excess of 12 feet per second.) The bridge openings will require removal of accumulated sediment and modification of entrances to accommodate the concrete channel.

This alternative would provide an increase in the safe yield of the water supply of Lee of 2.45 million gallons per day same as the selected plan. Recreation benefits (1,500 activity days) represent 8 percent of those provided by the planned project. The level of flood protection along Washington Mountain Brook is estimated to be comparable to that provided by the planned project. However, the additional erosion control and resulting reduction in sediment will not be realized, nor will the level of sediment control equal that of the planned project.

The environmental impact of installing the sediment control facility will be comparable to that of the sediment control facilities in the planned project. The concrete channel will destroy 4,000 feet of the most productive perennial stream habitat in the watershed.

All adverse effects associated with construction of October Mountain Lake, Schoolhouse Lake and installation of the pipeline would be avoided.

The benefits and costs for Alternative IV are as follows:

Costs: ($)

	Initial Cost	Average Annual Cost
Channel Work	3,098,700	106,860
Ground Water	6,832,700	553,490
Finerty Pond Acc.	17,000	1,810
Totals	9,948,400	662,160

Benefits: ($)

	Average Annual Benefit
Flood Prevention	74,520
Water Supply	422,210
Recreation	3,375
Total	500,105
Net Average Annual Benefit:	Minus 162,055

Alternative V

This alternative is the "Nonstructural" Alternative. Operation of the Washington Mountain Lake structure for flood prevention; ground water development, and providing access to Finerty Pond and its management for a fishery are included. The primary component addressing flood damages is relocation. A total of 14 residential structures would be relocated.

This alternative would provide a level of flood damages reduction equal to the planned project for residential property. No reduction of road, bridge, utility or erosion and sediment damages would be realized, other than that provided by the existing Washington Mountain Lake structure. The ground water development would provide water supply benefits equivalent to the planned project. The recreational benefits realized at Finerty Pond would be 8 percent of the planned project.

The potential for severe adverse social effects, relative to relocation, would accompany this alternative.

All adverse effects associated with the installation of additional floodwater retarding structures and the surface water for recreation and municipal supply would be avoided.

Benefits and costs for Alternative V are as follows:

Costs: ($)

	Initial Cost	Average Annual Cost
Flood Proofing or relocation	291,000[1/]	9,860[1/]
Ground Water	6,832,700	553,490
Finerty Pond	17,000	1,810
Totals	7,140,700	565,160

Benefits: ($)

	Average Annual Benefit
Flood Prevention (Residential only)	2,690
Water Supply	422,210
Recreation (Finerty Pond)	3,375
Total	428,275
Net Average Annual Benefit:	Minus 136,885

1/The costs are based only on those homes for which benefits were claimed in the planned project. Costs would be much higher to relocate or floodproof all homes susceptible to damage.

Alternative VI

This alternative is designed to provide municipal water supply capable of meeting the needs of Lee and Lenox through the year 2020.

Features include: filling of Washington Mountain Lake as a multiple-purpose flood prevention and recreation facility; development of October Mountain Lake for flood prevention, recreation and water supply (daily use); and development of Schoolhouse Lake as a flood prevention-water supply facility. The channel work will consist of:

1. Removal of sediment and debris from the bridge openings of all bridges in Reaches 1 and 2 as necessary, (Conrail Railroad, Mill Street, Washington Mountain Road, Woodland Street and Newton Bridge).

2. Construction of a concrete channel between the Conrail Railroad and Mill Street bridges, including concrete paving of the bridge floors (Figure 6).

3. Installation of riprap wingwalls at the entrance to the Mill Street bridge.

4. Clearing and shaping the channel immediately upstream of Mill Street for a distance of about 100 feet.

5. Removal of sediment and debris from the stream channel within Reaches 1 and 2 at locations where the 100-year flood is to be confined to the stream channel. The appropriate locations and required volumes of sediment to be removed will be determined by onsite inspections following installation of upstream structures. This volume is currently estimated to be between 100-300 cubic yards.

6. Construction of sediment control facilities above Newton Bridge with a combined capacity of approximately 7,600 cy.

October Mountain Lake would have a total storage capacity of 1,408 acre-feet, with 502 acre-feet for recreation (fishing), 14 acre-feet for sediment accumulation, 614 acre-feet for municipal water supply, and 278 acre-feet for flood control. The combined surface area of the recreation pool and water supply pool is 90 acres. The water supply element will provide an immediate safe yield of 0.5 mgd and ultimately 0.88 mgd (daily withdrawal).

Schoolhouse Lake would be developed to accommodate 655 acre-feet of permanent storage; 620 acre-feet for water supply and 35 acre-feet for sediment. Flood storage of 649 acre-feet would also be provided. The safe yield for water supply would be 1.57 mgd. The combined safe yield of this alternative is 2.45 mgd, or equivalent to the additional needs of Lee and Lenox through the year 2020.

Treatment of these surface waters shall include filtration and disinfection.

Water supply facilities required to deliver the water to consumers in Lee and Lenox are as follows:

Lee Installations:

A 16-inch pipeline leading from October Mountain and Schoolhouse Lakes would extend to the vicinity of the Upper Reservoir. This pipeline would be approximately 15,000 feet in length.

A water treatment plant with a capacity of 3.2 mgd (0.75 existing source + 2.45 mgd new development) would be located near the present Upper Reservoir. A 12-inch pipeline about 6,000 feet in length would be installed to convey water from the treatment plant to the low service system presently serviced through the Vanetti Reservoir. Since treatment will take place near the Upper Reservoir, the Vanetti Reservoir will be abandoned and replaced with a one MG storage tank, to meet peak demands. A two MG storage tank will be installed to supply water to the high service system. Pipeline facilities to service Lenox consist of about 4,000 feet of 12 inch pipe extending along Mill Street to the Lee-Lenox town boundary.

Lenox Installations:

A 17,200 foot, 12 inch pipeline will be installed from the Lee-Lenox town boundary, along Walker Street, then Main Street to Hubbard Street.

This alternative would provide the same level of flood prevention and sediment control as Alternative VIII. Creation of 224-acre and 90-acre pools, which will support a combination cold-warm water fishery, will provide 18,840 fishing activity days. Water supply benefits would result in an increase of the local safe yield by 2.45 mgd.

The benefits and costs for Alternative VI are as follows:

Costs: ($)

	Initial Cost	Average Annual Cost
October Mountain Lake	1,006,800	47,430
Schoolhouse Lake	1,238,400	50,360
Washington Mountain Lake	200,000	14,830
Sediment Control Facilities and Channel Work	420,600	14,250
Water Supply Facilities including: Chlorination, Water Treatment Plant, Intakes, Pipelines, and Storage Tanks	7,105,000	376,720
Totals	9,970,800	503,590

Benefits: ($)

	Average Annual Benefit
Flood Prevention	82,780
Water Supply	647,900
Recreation	94,860
Total	825,540
Net Average Annual Benefits:	Plus 321,950

Alternative VII

If no project is chosen, there would be no concerted effort or activity directe toward solving the water and related land resource problems that exist within the watershed and area of influence. The probable exception to this would be water supply needs.

As previously stated, the conservation land treatment program and participation in the National Flood Insurance Program would continue. However, neither of these programs will have a significant effect on reducing or eliminating present floodwater and sediment damages or hazards.

Water Quality within the watershed is generally good. The water quality of Washington Mountain Brook through the lower developed reach is expected to be upgraded somewhat in the future through the availability of sewage collection facilities. However, throughout the watershed, water quality

will remain unchanged if the planned project is not implemented. Natural nonpoint sources would remain the principal nutrient and pollutant sources. Washington Mountain Brook would continue to transport large quantities of sediment and debris into the lower reaches, especially during high flows. Periodically and following major floods, the removal of sediment and debris from the stream channel in Reaches 1 and 2 would continue. This will promote significant increases in sediment transport and total disruption of the stream regime in certain locations. This will be a recurring short-term, but cumulative impact.

Since the objective of providing additional municipal water supply is viewed as a necessity, the immediate and projected needs will be satisfied to some degree by development of an alternative source. The development of another source or sources of water supply by Lee and/or Lenox may be costly in both dollars and environmental effects.

Further reductions in floodwater and sediment damages would not be realized without completing the planned project. The existing Washington Mountain Lake site alone does not provide an adequate level of flood protection to existing roads, bridges and residences, as it controls only 15 percent of the watershed. Annual sediment removal from the alluvial fan would continue to average about 4,100 cubic yards. The average annual damage from floodwater and sediment deposition would remain at $88,580.

Land use in the watershed will remain essentially unchanged if the planned project is not implemented. As stated previously, approximately 90 percent of the watershed is included in the October Mountain State Forest. This land use is not expected to change through the year 2000.

Overall wildlife resources in the watershed would remain essentially unchanged if the planned project were not implemented. Changes which would occur would be part of natural succession, and human influences would be minimal. Timber harvest would probably represent the greatest human intrusion. Without the proposed project, timber in the planted softwood stands will probably be harvested by the year 2000. Many of the trees in these stands now are of sawtimber size.

Successional trends in the forest predicted by Egler (1940) for an area including the Washington Mountain Brook Watershed will continue. He noted that under the unbroken canopy, hemlock and beech were the best suited species and postulated that one or both of these species would eventually dominate the forest. He also predicted that species, such as sugar maple, red maple, ash, cherry, and red oak, whose seedlings usually persist in closed forests, would become less abundant in the future. In addition, species which are generally considered intolerant, such as yellow birch, paper birch, black birch, hop hornbeam, and white pine, would become greatly reduced in number and even locally absent. These trends predicted by Egler 35 years ago appear to have been well founded. Except for the yellow birch, the intolerant species listed by Egler are now locally absent.

The cherry-ash-maple community in the watershed appears to be giving way to a hemlock-beech community. Reproduction of cherry is prolific, but survival of saplings taller than 6 feet is limited. Ash seedlings are

scarce. Sugar maple seedlings and saplings appear to be more successful, and the sugar maple will probably remain an important species in the hardwood forest for many years.

Spruce shows advanced reproduction in mixed forests at higher elevations and will continue to occupy its important position in mixed forests.

The density of understory species can be expected to decrease under the closed canopy, but death of individual older trees will continue to create scattered openings where shrubs can develop. Any forecast of future floristic composition of forests in the watershed assumes no natural catastrophies, such as, disease, insect infestation, ice storms or unusual climatic events. Natural catastrophies are normal occurrences in the forest regime and may produce dramatic changes, altering well established successional patterns.

Wildlife populations are so intimately tied to vegetative composition that changes in the animal community will certainly follow changes in the floral community. The trend toward an unbroken canopy will reduce the understory density which many species, including deer, rely upon. Wildlife which now utilizes varied forest types will continue to be abundant. Porcupines, gray fox, chipmunks, gray and red squirrels would not be seriously affected by natural changes in forest composition. Red foxes and woodchucks may suffer a reduction of available habitat. The size of magnolia warbler populations, which are restricted to planted coniferous stands for nesting, may diminish as these stands are harvested. Increasing public use of the Appalachian Trail may result in some minor changes in nesting distribution of the red-shouldered hawk.

Wetland types are expected to continue the pattern of change to a progressively drier state. The open wetland types now present will succeed to the woody wetland types and ultimately will be forested. Beaver activity would, however, cycle some of these sites and other available sites back to the open wetland types.

Fish populations will remain essentially unchanged if the planned project is not implemented. The trout stocking program in the lower reaches of the brook will continue to provide sport fishing. None of the species encountered during the survey appear to be in danger of extinction from the watershed.

Periodic channel cleanout work in the urbanized area would continue to create short-term impacts on the stream fishery and benthic organisms.

Recreational opportunities within the watershed will not increase significantly without completion of the planned project. The public will continue to be excluded from Finerty Pond since the town of Lee will continue to retain the pond for emergency water supply. Locally, additional opportunities for boating (except canoeing on the Housatonic River) and fishing are not evident in the foreseeable future. Camping and day-use facilities are planned for Buckley-Dunton Lake (within the October Mountain State Forest); day-use and canoe-camping facilities along the Housatonic River in Lee and Lenox. The primary recreation objective of fishing would not be augmented.

Archaeological and historic sites would probably remain unprotected and unstudied without the project. Without protection these relics will be subject to vandalism and pilfering.

The scenic quality of the watershed will generally remain unchanged if the proposed project is not implemented.

All of the adverse environmental effects of installing the selected plan would be avoided if this alternative were selected. However, the result would be the annual loss of net monetary benefits of about $74,310, foregone by not implementing the planned project.

Alternative VIII

This alternative was the preferred plan at an earlier stage in planning.

Features include: completion of Washington Mountain Lake as a multiple-purpose flood prevention and recreation facility; development of October Mountain Lake for flood prevention, recreation and water supply; and development of Schoolhouse Lake as a flood prevention-recreation facility. The channel work detailed in the selected plan would also be installed.

Proportionment of October Mountain Lake would be identical to the planned project, with winter withdrawal of the water supply storage. This development would provide a safe yield of about 0.5 mgd.

Schoolhouse Lake would have a total storage capacity of 789 acre-feet, with 105 acre-feet for recreation, 35 acre-feet for sediment accumulation, and 649 acre-feet for floodwater retention. The surface area of the recreational pool would be 15 acres and the flood pool would be 40 acres.

This alternative would provide the same level of flood protection as the selected plan. The recreation opportunity would provide 19,740 fishing activity days, which is about 5 percent greater than the selected plan. The 0.5 mgd increase in the safe yield of the water supply represents only 20 percent of the planned project.

Land use changes at the Schoolhouse Lake site would be generally less than the planned project as follows: 21 acres less forest land lost, 4 acres less wetland lost, and an increase of 9 acres temporarily impaired.

This alternative does not meet the Lee and Lenox water supply needs. To increase the water supply yield of this alternative would amount to a duplication of the planned project. For these reasons this alternative is no longer being considered.

Summary of Alternatives

Table 20 is a summary of alternative plans and planned project costs and major provisions. The comparative costs represent initial construction costs, and annual Operations and Maintenance costs capitalized at an interest rate of 3 1/4 percent.

Appendix E contains summaries of alternative actions related specifically to potential water supplies. The relative merits of the selected plan may be determined by comparison.

TABLE 20

SUMMARY OF ALTERNATIVE PLANS

ALTERNATIVE	DESCRIPTION	COMPARATIVE COST 1/	MAJOR PROVISIONS
I.	Single-Purpose Flood Prevention Structures (3), Ground Water Development, Channel Work	$18,100,300	Flooding: Average Annual Redu of $82,780 in flood damage Recreation: 1,500 activity da for fishing Water Supply: 2.45 mgd safe y
II.	Single-Purpose Flood Prevention Structures (2), Multiple-Purpose Flood Prevention and Recreation Structure (1), Ground Water Development, Channel Work	18,484,600	Flooding: Average Annual Redu of $82,780 in flood damage Recreation: 13,440 activity d for fishing Water Supply: 2.45 mgd safe y
III.	Single-Purpose Flood Prevention Structure (1), Multiple-Purpose Flood Prevention and Recreation Structure (1), Multiple-Purpose Flood Prevention and Water Supply Structure (1), Channel Work	10,708,300	Flooding: Average Annual Redu of $82,780 in flood damage Recreation: 13,440 activity d for fishing Water Supply: 1.1 mgd safe y
IV.	Single-Purpose Flood Prevention Structure (1), Extensive Channel Work, Ground Water Development	19,542,700	Flooding: Average Annual Red of $82,780 in flood damage Recreation: 1,500 activity d for fishing Water Supply: 2.45 mgd safe
V.	Single-Purpose Flood Prevention Structure (1), Nonstructural, Ground Water Development	16,680,100	Flooding: Average Annual Red of $2,240 in flood damage Recreation: 1,500 activity d for fishing Water Supply: 2.45 mgd safe
VI.	Selected Plan	14,863,200	Flooding: Average Annual Re of $82,780 in flood damage Recreation: $18,840 activity for fishing Water Supply: 2.45 mgd safe
VII.	No Project Activity		Flooding: No Reduction Recreation: None for fishing Water Supply: Probably betwe mgd and 2.5 mgd
VIII.	Multiple-Purpose Flood Prevention and Recreation Structures (2), Multiple-Purpose Flood Prevention, Water Supply and Recreation Structure (1), Channel Work	5,574,100	Flooding: Average Annual Red of $82,780 in flood damage Recreation: 19,740 activity for fishing Water Supply: 0.5 mgd safe

1/ Comparative Cost is the initial cost plus the annual Operation and Maintenance cost capitalized at 3 1/4 percent.

SHORT-TERM VS LONG-TERM USE OF RESOURCES

Projected long-term land use changes in the Washington Mountain Brook Watershed will be minimal. The October Mountain State Forest, which occupies approximately 90 percent of the watershed, will remain under the protection and management of the Commonwealth of Massachusetts. Development into the flood plain of the Washington Mountain Brook in the lower portion of the watershed is regulated by provisions of the National Flood Insurance Program and supporting zoning ordinances of the town of Lee. The planned project has been incorporated into future use plans for the Berkshire Mountains for the purposes of recreation (Department of Natural Resources, 1973 and Department of Environmental Management, 1976) and water supply (BCRPC, 1969). The future plans for use of the watershed are tenuous and have been modified since their inception. The plans incorporated the proposed lakes as part of the future environmental setting. The Department has inaugurated a program to develop other existing sites in the vicinity to satisfy current and projected intensive recreational demands.

The planned project was formulated for the purposes of providing flood protection to existing structures in the flood plain of the Washington Mountain Brook, reducing erosion and sedimentation in the brook, increasing the recreational use of the October Mountain State Forest, and providing additional water-supply storage for the town of Lee. Implementation of the planned project would accomplish these purposes with an immediate cost of 65 acres of wetland and 129 acres of forest and their associated wildlife habitat. (The sustained timber yield for the forest land for the long term is estimated to be about 75 board feet per acre annually.) Implementation of the planned project would irreversibly commit these areas to the purposes of the project and would foreclose their future use for other purposes.

The proposed project is compatible with future, long-term uses of the land, water, and natural resources of the Washington Mountain Brook Watershed. However, regional plans, such as those for recreation and water supply, were formulated after the project's inception and have incorporated the proposed lakes as part of the future environmental setting.

The planned project is designed to be fully effective for 100 years and with proper maintenance should provide benefits after this period.

There are presently four active watershed projects in the southeastern Berkshire County and western Hampden County area. These planned watershed projects are in portions of 11 towns which have a combined acreage of approximately 6,804 acres of Types 1, 2, 3, 4, 6, and 8 wetlands. Wooded swamp constitutes approximately 4,742 acres of wetland in the 11 towns. If all watersheds were completed as presently planned, there would be a total reduction of 186 acres of Types 1, 2, 3, 4, 6, and 8 collectively, and a loss of 258 acres of wooded swamp (Type 7). Expressed as a percentage this loss is 2.7 percent of Types 1, 2, 3, 4, 6, and 8 wetlands (collectively) and 5.4 percent of the Type 7. The overall wetland loss would be 3.8 percent of the present amount.

The project area of Washington Mountain Brook, 9.0 square miles, is too small to contribute significantly to potential cumulative hydrological effects within the Housatonic River Basin.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

In addition to land previously committed at the Washington Mountain Lake site, the present wildlife habitat values will be eliminated on a total of 167 acres at Schoolhouse and October Mountain Lakes. This 167 acres is comprised of: 129 acres of forest land; 34 acres of wetland; and 4 acres, which is currently the borrow area. Periodic inundation of an additional 41 acres of forest land in the floodwater detention pools will impair its wildlife habitat value. Areas to be occupied by the dams, emergency spillways and borrow areas will become grassland habitat, totaling 30 acres of the 167 acres permanently committed.

Approximately 5,400 feet of perennial stream and 1,500 feet of intermittent/ephermeral stream will be incorporated into the planned lakes. The channel work will commit approximately 400 feet of perennial stream to sediment control facilities, and 50 feet to concrete channel, although flow will not be impeded.

Installation of the water supply pipeline will convert 1 to 1.5 acres from forest land to grassland. Other commitments, including labor and materials which will be expended to install, operate and maintain the project, are irreversible. Most of the construction materials (rock and fill) are being extracted from within the watershed. Other commitments can and will be retrieved in the form of project benefits.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

General

The Berkshire Conservation District applied to the U.S. Department of Agriculture for planning assistance for the Washington Mountain Brook Watershed in 1961. In February 1961, the Massachusetts Water Resources Commission approved the application at the state level and notified the Soil Conservation Service. Preliminary investigations were conducted by the Soil Conservation Service, and the project was authorized for planning in 1963. Notification of the intent of the sponsors to develop a watershed plan and a request for cooperation was sent to concerned local, county, state and federal officials.

Preparation of the watershed plan involved a coordinated effort by local, state and federal agencies. At the request of the project sponsors, all three of the planned dams were planned to include recreation as an added purpose. One of the structures (October Mountain Lake) also includes municipal water supply as an added purpose. Planning was coordinated with

An informal field review of the watershed plan and a public meeting were held in 1966. Representatives of local, county, state and federal agencies, as well as interested citizens attended. The project plan received favorable comments from all who attended. Comments were received from the U.S. Public Health Services, U.S. Fish and Wildlife Service, Massachusetts Division of Fisheries and Game, U.S. Forest Service, Massachusetts Department of Public Health and others.

The watershed plan was submitted to Congress and the project was approved for installation on April 1, 1969. The watershed plan was supplemented in December 1969, June 1971, February 1973, and July 1980.

In 1975 and 1976, an environmental assessment of the project measures remaining to be installed was conducted by EcolSciences, Inc. and the Soil Conservation Service. The assessment was coordinated with local, state and federal agencies, as well as interested local groups and citizens. The State Historic Preservation Officer and National Park Service were consulted regarding historical and archaeological sites that may be affected by the project.

In November of 1976, the Soil Conservation Service published in area newspapers a Negative Declaration to inform the public that an Environmental Impact Statement would not be prepared for the Washington Mountain Brook Project. The decision not to prepare an Environmental Impact Statement was based on the environmental assessment which showed that installation of the remaining project measures would not create significant adverse impact on the environment, and there did not appear to be significant controversy associated with the project.

Controversy surrounding the project subsequently developed during the review period of the Negative Declaration. On December 6, 1976, an 18-page review critique of the Environmental Assessment, which was critical of the findings, was forwarded to the Massachusetts Secretary of Environmental Affairs. The transmittal letter urged that an Environmental Impact Report be required, before further activity is undertaken. The Massachusetts Secretary of Environmental Affairs, in December 1976, directed the Massachusetts Division of Water Resources to prepare a Limited Environmental Impact Report. A public meeting was held on December 28, 1976 with the Secretary to review that decision. The following agencies, groups and individuals were represented or present at that meeting.

Senator John H. Fitzpatrick
Board of Selectmen, Town of Lee
Conservation Law Foundation
Schweitzer Division, Kimberly-Clark Co., Lee
The Berkshire Eagle, Pittsfield
Department of Public Works, Town of Lee
Tighe and Bond Consulting Engineers, Inc.
Berkshire County Regional Planning Commission
Berkshire Natural Resources Council
Massachusetts Division of Forests and Parks
Massachusetts Division of Water Resources

Massachusetts Audubon Society
Massachusetts Water Resources Commission
Massachusetts Executive Office of Environmental Affairs
Soil Conservation Service
Appalachian Mountain Club
Planning Board, Town of Lenox
Representative Dennis J. Duffin
Representative Richard J. Dwinell

In February 1977 the Draft Environmental Impact Report was submitted to the Secretary's Office and distributed to the following agencies, groups and interested individuals.

Office of State Planning
Attorney Generals Office
Division of Water Resources
Water Resources Commission
Senator John H. Fitzpatrick
Senator John W. Olver
Representative Dennis J. Duffin
Natural Resources and Agriculture Committee
Berkshire County Regional Planning Commission
Board of Selectmen, Town of Lee
Daniel J. Gaherty
David L. Burg
Appalachian Mountain Club
Berkshire Natural Resources Council
Berkshire County Commissioners
Massachusetts Audubon Society
Schweitzer Division, Kimberly-Clark Co. (Milton Gordon)
Conservation Commission, Town of Lee
Conservation Commission, Town of Washington
Board of Selectmen, Town of Washington
Division of Forests and Parks
Soil Conservation Service
Conservation Law Foundation

In May 1977 a watershed town and informational meeting was held in Lee. The following agencies, groups and individuals participated or were represented.

Massachusetts Water Resources Commission
Massachusetts Division of Forests and Parks
Massachusetts Division of Fisheries and Wildlife
Conservation Law Foundation
Executive Office of Environmental Affairs
Massachusetts Audubon Society
Soil Conservation Service
Board of Selectmen, Town of Lee
Schweitzer Division, Kimberly-Clark Co., Lee
Department of Public Works, Town of Lee
Tighe and Bond Consulting Engineers, Inc.

Board of Public Works, Town of Lee
Congressman Silvio O. Conte
Massachusetts Division of Water Resources
Massachusetts Department of Environmental Management
Massachusetts Department of Fisheries, Wildlife and Recreational Vehicles
Massachusetts Department of Food and Agriculture
Berkshire County Regional Planning Commission
Berkshire Museum
Berkshire Community College
WBEC Radio
The Berkshire Eagle
Berkshire Natural Resources Council
Representative Dennis J. Duffin
Senator John H. Fitzpatrick

Additional archaeologic field studies have been conducted at the request of the staff archaeologists for the State Historic Preservation Officer to verify previous conclusions that no prehistoric Indian sites exist.

In August 1977 the Board of Selectmen of the town of Lenox requested the Massachusetts Water Resources Commission to consider the potential of the Washington Mountain Brook Project to provide enough municipal water supply benefits to satisfy the needs of the town of Lenox as well as the town of Lee. This request received endorsement by the Project Sponsors and those agencies closely associated with current planning efforts. Appropriate studies are underway.

In September 1977, the Soil Conservation Service made public a Notice of Intent to prepare an Environmental Impact Statement for this project. The Notice of Intent appeared in the Federal Register of September 16, 1977; the Massachusetts Environmental Monitor on September 22, 1977; The Berkshire Eagle on September 16, September 22 and September 28, 1977; and the Springfield Union on September 10, 1977. In addition, copies of the notice were sent to a total of 73 agencies, groups, and interested individuals, aside from USDA agencies. The Notice of Intent advised that "Those interested in providing information, which may be considered in preparing this statement, should submit data to the following Responsible Federal Official by October 3, 1977." (State Conservationist)

In response to the town of Lenox's request, the town of Lee requested SCS to assess the capability of the Watershed Project to meet the municipal water supply needs of both towns. This study was undertaken with cooperation from the Massachusetts Water Resources Commission, U.S. Geological Survey, DEQE, Division of Water Supply and others. Additional water supply studies were conducted by Tighe and Bond Engineers at the direction of the town of Lee. Whitman and Howard, Inc. provided inputs relating to the town of Lenox. The results of these studies are included in this report.

In May 1978, a preliminary draft of this report (combined EIR/EIS) was prepared by SCS and circulated to the sponsors. The purpose of that draft was to enable the sponsors to review their project and to provide additional inputs or revisions as appropriate.

On June 12, 1978, the Massachusetts Water Resources Commission voted to forward the Sponsors' Draft EIR/EIS (with incorporated comments) to the Secretary, EOEA as a Draft EIR.

On June 21, 1978, the Lee Board of Selectmen sent a letter to the other sponsors of the Watershed Project, which stated in part:

> "In reviewing the preliminary Environmental Impact Statement - Environmental Impact Report prepared by the United States Department of Agriculture, Soil Conservation Service for the above referenced project, we note that the Statement - Report was written around the existing watershed plan which was approved in April 1969 and supplemented in December of 1969, June of 1971, and February of 1973.
>
> "As stated in the Environmental Impact Statement - Environmental Impact Report, the Town of Lee's current water supply situation has changed substantially since the development of the original watershed plan. . . . . .
>
> "Realizing our current needs and current water supply status, we find it necessary at this time to pursue the development of additional water for meeting our current and future needs, as well as possibly helping Lenox. . . . .
>
> "The Town of Lee, as co-sponsor of the proposed Washington Mountain watershed project, supports a revision to the present watershed plan which would include development of the watershed as mentioned in Alternate No. 6 of the draft Environmental Impact Statement - Environmental Impact Report dated April 1978. Also, the Town of Lee respectfully requests that you as co-sponsor of the project support the revision to the watershed plan for the purpose of providing the needed water supply for the Town of Lee.
>
> "In order for the Soil Conservation Service to finalize their Environmental Impact Statement - Environmental Impact Report, the Town of Lee requests that you give this proposal your earliest possible consideration. . . . . "

On June 27, 1978, a coordination meeting was held with personnel from the U.S. Fish and Wildlife Service.

On August 13, 1979, the Massachusetts Water Resources Commission voted to revise the watershed plan to reflect the levels of development outlined in Alternative VI in the Draft Environmental Impact Report, dated July 1978. The Watershed Plan was officially supplemented on July 16, 1980.

On March 27, 1981, a coordination meeting was held with personnel from the U.S. Fish and Wilslife Service.

A public meeting to discuss and receive comments on the Draft EIS was held in Lee on October 15, 1980. About 25 people were in attendance.

Coordination with local, state and federal agencies has been maintained throughout the planning phases of this project and will continue to be maintained during its implementation.

Draft EIS

The draft EIS was transmitted to the Environmental Protection Agency on September 9, 1980. In addition, the following agencies and organizations were asked to comment on the draft EIS. An (R) indicates written comments were received.

Department of the Army (R)
Department of Commerce (R)
Department of Health and Human Services (R)
Department of the Interior (R)
Department of Transportation
Environmental Protection Agency (R)
Federal Energy Regulatory Commission (R)
Office of Equal Opportunity, USDA (R)
Massachusetts Water Resources Commission
(Designated State Agency)
Executive Office of Communities and Development
(State Clearinghouse)
Berkshire County Regional Planning Commission (R)
(Regional Clearinghouse)
Massachusetts Historical Commission
Berkshire Natural Resources Council
Massachusetts Audubon Society (R)
Massachusetts Executive Office of Environmental Affairs (R)
Conservation Law Foundation (R)
Appalachian Mountain Club

The written comments received are contained in Appendix F. The following discussions are a restatement and disposition of those comments. In some cases, several repetitive responses were received. In those instances, a summary of the comments are given, along with a list of the organizations providing the comment. (These organizations are as follows: Corps of Engineers, CE; Environmental Protection Agency, EPA; Department of the Interior, USDI; Massachusetts Executive Office of Environmental Affairs, EOEA; Massachusetts Audubon Society, MAS; Conservation Law Foundation, CLF.

Summarized Comments/Responses

1. Two commentors emphasized the need for permits, under Section 404 of the Clean Water Act. (CE, EPA)

Response:

SCS and project sponsors recognize the need for permits under Section 404 of the Clean Water Act. A description of the permit program has been added to Appendix A, and referenced on page 16. The responses to specific comments received on the Draft EIS should resolve the issues which concerned the regulatory agencies and assist them in their future permit determinations.

2. Two commentors expressed difficulties in determining which water supply options were technically feasible and which were also cost effective. (CE, EPA)

Response:

The comment is well taken. In the Draft EIS, all water supply options were considered technically feasible except ground water withdrawal from the Woods Pond aquifer. The Final EIS clearly identifies that all options are technically feasible; and all options are cost effective, except the Woods Pond aquifer. (Adding appropriate treatment costs to make this option technically feasible resulted in it not being cost effective.) To better assist in the comparison of alternatives, the water supply component consisting of ground water development has been increased to the level of the preferred alternative. Refer to Appendix A for an expanded discussion of Water Supply benefits and procedures.

3. Several commentors suggested that the uncertainties regarding the ground water options, specifically the acceptability of water quality in each aquifer should be positively confirmed or denied. (EOEA, CLF, MAS, CE)

Response:

The water quality, or the acceptability of the sources for water supply development has been resolved and further information is presented on pages 91 and 92 and in Appendices B and E.

4. Two commentors suggested that the nonstructural alternative be re-formulated to possibly include sediment traps and a water supply component other than ground water. (CE, EPA)

Response:

The nonstructural alternative was formulated to primarily avoid the greatest adverse impacts of the selected plan. The only water supply options which are more "cost-effective" are surface water sites, of which the component in the selected plan is the least cost option. One primary reason for selection of the preferred plan was that it was the most cost-effective solution to meet the project objectives.

5. Several commentors requested that the necessity and degree of treatment for each water source be fully resolved; and all costs associated with treatment be included as a project cost or alternative plan cost, as appropriate. (CE, EPA, EOEA, CLF, MAS)

Response:

The need for treatment of each water source in respect to its level of development has been determined and included in each alternative, including the preferred plan. The cost of treatment associated with the preferred plan (planned project) is included, and no longer labeled "Phase II."

6. Several commentors questioned the validity of claiming the multiple-purpose benefits of recreation and water supply for a single impoundment; and whether these concurrent uses were in themselves incompatible. (CE, EPA, USDI, EOEA, MAS)

Response:

Concurrent uses of recreation and water supply will only occur at October Mountain Lake. The recreation use will only include fishing. The town of Lee Board of Health has stated that ". . . October Mountain Lake be posted specifying no swimming and the use of internal combustion engines in or on the lake be prohibited." (See Appendix A for text of letter.) At the request of the town of Lee and at the direction of the Commissioner of the Department of Environmental Management, references to any future intensive recreation facilities have been removed from the Final EIS. There are no plans for such a development. In addition since filtration and disinfection are included treatment processes, no conflict or incompatibility shall exist.

7. Several commentors expressed concern for the potential significant impact of installing the water supply pipeline. (EOEA, EPA, CE)

Response:

The potential for the stated impacts does exist. So does the potential to affectively control the possible erosion and sedimentation. The number of stream crossings has been reduced to five, and final planning and design will reduce this number if practical. Final route determination layout, and design will enable engineers to be site specific in erosion control measure requirements. Statements to this effect have been added to the Pollution Control section.

8. Several comments noted that the draft EIS failed to discuss the project or alternatives relative to Executive Orders 11988 and 11990 on Floodplain Management and Protection of Wetlands, respectively. (CE, EPA, USDI)

Response:

Both Executive Orders are now specifically discussed in the planned project, alternatives and environmental impact sections. Mitigation features related to each Executive Order associated with the selected plan will be identified in detail in the Record of Decision (ROD).

9. Several comments were received regarding the benefit-cost ratio and expressed concern that the true costs of the project were not displayed. (EPA, MAS, CLF)

Response:

The total estimated installation cost of the remaining project are presented in Table 2. These costs have been updated to 1980 using the average Engineering News Record index for 1980. The costs of appropriate treatment are no longer referred to as "Phase II Project Costs."

The applicable interest rate for water resource project evaluation is determined by the U.S. Water Resources Council in accordance with Chapter IV D "Standards for Planning Water and Related Land Resources" (39 FR 29242). SCS procedures provide for the continual use of an interest rate once a watershed plan has received Congressional approval. The Washington Mountain Brook Watershed Plan was approved by Congress in 1968 and the applicable interest rate was 3 1/4 percent.

Appendix A is primarily devoted to economic analyses of the preferred plan. This appendix contains an economic summary reflecting the 3 1/4 percent interest rate, and in response to comments, an alternative economic evaluation at 7 1/8 percent interest rate. (The 7 1/8 percent interest rate was the interest rate for fiscal year 1980, covering the period when Supplemental Watershed Plan No. 4 was prepared and signed. This supplemental plan, which also includes previously incurred costs of building Washington Mountain Lake Dam, has now been added to Appendix A as further background material.

SCS believes that the final statement fully discloses the true costs and benefits of the preferred plan and alternative plans, and provides ample economic data which together with the environmental evaluations, will enable the project sponsors to make an informed, rational decision regarding the project.

10. Several comments were received which questioned the validity of not including (in the EIS) the incurred construction cost of the Washington Mountain Lake dam in the cost analysis of constructing the remainder of the project (EPA, MAS, CLF)

Response:

The Watershed Protection and Flood Prevention Act, Section 5, requires that the benefits of every "plan" exceed the costs associated with implementing the plan. The Soil Conservation Service prepares documents called Watershed (Work) Plans which describe the project in detail and provide cost/benefit data for the entire plan. From time to time these Watershed Plans must be updated. To accomplish this, SCS prepares supplements to the original plan. In the case of Washington Mountain Brook Watershed, the latest supplement (#4) was prepared in July 1980. In this document the economic feasibility of the total plan (including Washington Mountain Lake Dam and dike) is reaffirmed.

A copy of Supplement #4 has been added to Appendix A.

11. Several comments were received which suggested that water conservation (President's Water Policy message of June 6, 1978) should be given more thorough consideration. (EPA, USDI, MAS)

Response:

Water conservation is now specifically addressed in the Municipal and Industrial Water Supply Problems section. The discussion details the present level of water conservation in Lee and Lenox, which was omitted in the draft EIS.

12. Several commentors felt that the wetland losses had not been adequately acknowledged or accounted for. (EPA, USDI, MAS, CLF)

Response:

The Soil Conservation Service feels that the wetland to be impacted by the preferred plan was adequately identified and evaluated. However, the plan was deficient in mitigating the wetland losses. Mitigative features have been added to the preferred plan and are detailed in the Planned Project section. Revisions were also made to Table 19 to more correctly reflect the expected character of the 224-acre body of water at Washington Mountain Lake. Also, see response to comment #8.

13. Three commentors noted that there was not an adequate discussion of the Lee-Lenox water supply arrangement. (MAS, CLF, EOEA)

Response:

The towns of Lee and Lenox have agreed to cooperate in developing a permanent regional water supply, based on the 1980 Watershed Plan (Supplement #4). A copy of the agreement is included in Appendix A.

14. One commentor suggested that a brief explanation of the provision of PL83-566 would be helpful.

Response:

An overview of PL83-566, the Watershed Protection and Flood Prevention Act, is included in a new introductory section entitled, Summary of the Plan Formulation Process.

15. One commentor asked how the annual costs and benefits of the water supply facilities were derived.

Response:

The annual cost is based on an amortization of construction costs, including treatment facilities, plus the annual operation and maintenance cost. These costs are associated with the preferred plan. The same economic analysis of annual costs is done for the "most likely" alternative, aside from the preferred plan. The net benefits attributable to water supply is the difference between the annual costs of the preferred plan and the "most likely" alternative.

16. The Corps of Engineers commented that the value of harvested timber at the impoundment sites should not have been deducted from the land rights cost.

Response:

The harvesting of timber on the sites preceeded the effective date of the CEQ regulations (7/1/79) on which this comment is based. Although the amount originally deducted from the land rights costs was not significant enough to influence the choice of alternatives, this amount has been restored to the land rights cost at both sites.

17. The Corps of Engineers commented that the final EIS should address the anticipated impacts of the project on downstream water quality and flow regime.

Response:

These discussions have been expanded on pages 97 and 102.

18. The Corps of Engineers inquired as to the basis for expecting an enhancement of furbearer trapping, when stream habitat is replaced with lake habitat.

Response:

There are presently only two active beaver flowages in the watershed. Since there is no significant storage for water supply in this watershed, the presence of beaver impoundment during a dry or drought period hampers attempts to withdraw water from the instream intake. Present management of the watershed for water supply also means management of the beaver to minimize their presence. With the provision of ample water supply storage, the activities of beaver will become less of a concern. In addition, observations and experiences of wildlife personnel have indicated that beavers will colonize at impoundments like Washington Mountain Lake at the rate of one lodge per mile of shoreline. Washington Mountain Lake will have 3.5 miles of undeveloped shoreline, of which 2.2 miles is dominated by hardwood woodland.

Beaver are continuing to increase in Berkshire County as indicated both by the steady increase in the beaver trapping harvest and the increasing number of beaver complaints received by the Massachusetts Division of Fisheries and Wildlife. Establishment of beaver colonies at unoccupied sites is expected by means of immigration of 2 year old beaver from other colonies.

19. The Corps of Engineers suggested that the final EIS contain a brief discussion of the issues which led to the preparation of the draft EIS.

Response:

The discussion in the "Consultation and Review . . ." section has been expanded to include the sequence of events which led to the preparation of the draft EIS.

20. The EPA commented that the project's construction would have a significant adverse impact on the town of Lee's current drinking water supply, namely Washington Mountain Brook.

Response:

The DEIS apparently failed to adequately define the method and frequency of use of the watershed for water supply by the town of Lee.

Lee has relied on Washington Mountain Brook for water supply during droughty periods to supplement their Codding Brook supply. This was the case in 1980. When in use, water is withdrawn from the stream through an intake, located at the point of the proposed upper sediment control facility. The watershed will not be used for water supply during construction of the impoundments. When the sediment control facilities are installed, the stream intake will be removed. Water from the upstream reservoirs will be conveyed by pipeline to the Upper Reservoir on Codding Brook. The preferred plan includes a filtration plant capable of treating water from Washington Mountain Brook and the Codding Brook supply.

21. One EPA comment was concerned with the references in the draft EIS to potential development of intensive recreation facilities around the reservoirs, sometime in the future.

Response:

See response to comment #6.

22. One EPA comment suggested that the value of wetlands as floodwater retention areas should be given consideration.

Response:

The value of wetlands as floodwater retention areas is a basic consideration of the hydrologic studies conducted by SCS on all watershed projects of this type.

23. The USDI considered the planned flow releases inadequate to sustain indigenous acquatic organisms during times of the year critical to their survival and maintenance. "Inadequate flows are particularly true for October Mountain and Schoolhouse Lakes. We recommend Aquatic Base Flows (ABFs) of 4.0, 0.5, and 1.0 cubic feet per second per square mile of drainage area (cfsm) for the spring, summer, and fall critical periods, respectively. Alternately, minimum releases of median monthly flows would be adequate. Furthermore, when inflows immediately upstream of the project fall below the ABFs, outflows from the project should equal the inflows."

Response:

Discussions with U.S. Fish and Wildlife personnel revealed that the median August daily flow would be an acceptable flow release, since this was the most critical period. The Walker Brook (adjacent watershed) stream gage record of 1963 to 1977 was used to estimate the August median daily flow for Washington Mountain Brook. The Walker Brook record yielded a value of 0.28 cubic feet per second per square mile (CSM).

The low flow release from Schoolhouse Lake has been doubled to 0.20 cfs. This increases the combined low flow release from the flood controlled portion of the watershed to 0.26 csm; which is not significantly different from 0.28 csm, given the transposition of estimates from one watershed to another.

24. The USDI noted that the historical and archeological survey did not include any standing buildings and structures of historic, architectural, or engineering significannce.

Response:

The draft EIS only failed to mention that there are none.

25. The USDI commented that measures designed to prevent looting of cultural resources should be developed in coordination with the State Historic Preservation Officer (SHPO).

Response:

The SHPO has been consulted further regarding this comment, and the recommendation is that the sites be "staked," but no designed measures are necessary.

26. The USDI also commented that results of studies to determine the eligibility of the agricultural village for the National Register should be included in the final EIS; as well as a letter from the SHPO stating results of consultation and compliance.

Response:

The agricultural village has been determined to be eligible for the National Register, but nomination is not imminent. See letter from SHPO in Appendix B.

27. The EOEA and MAS commented that the demand figures presented in the report based on population projections and the industrial demand figures are unsubstantiated; the demand for water, both present and future, should be adequately documented.

Response:

We feel that the population projections and demand figures are reasonable and adequately documented. For a further, indepth response, see appended letter from Berkshire County Regional Planning Commission, dated 11/25/80, in Appendix F.

28. The EOEA and MAS commented that the draft EIS was deficient in discussions relating to Article 97, of the State Constitution, which concerns dedicated state parklands.

Response:

Article 97 is an amendment to the state Constitution, approved by the voters at the statewide election on November 7, 1972. In an opinion from the Attorney General,

"Article 97 of the Amendments to the Massachusetts constitution establishes the right of the people to clean air and water, freedom from excessive and unnecessary noise, and the natural, scenic, historic and esthetic qualities of their environment. The protection of the people in their right to the conservation development and utilization of the agricultural, mineral, forest, water, air and other natural resources is declared to be a public purpose. Lands, easements and interests therein taken or acquired for such public purposes are not to be disposed of or used for other purposes except by two-thirds roll-call vote of both the Massachusetts Senate and House of Representatives.

"Answering the questions of the House of Representatives I advise that the two-thirds roll-call vote requirement of Article 97 applies to all lands, easements and interests therein whenever taken or acquired for Article 97 conservation, development or utilization purposes, even prior to the effective date of Article 97, November 7, 1972. The Amendment applies to land, easements and interests therein held by the Commonwealth, or any of its agencies or political subdivisions, such as cities, towns and counties."

Sponsors of the Washington Mountain Brook Project are currently preparing legislation to be submitted to the Legislature for approval.

29. The CLF noted that the draft EIS did not discuss how Schoolhouse Lake will answer a water supply need.

Response:

The Planned Project section, page 7 now fully details how Schoolhouse Lake coupled with October Mountain Lake will supply an additional safe yield of 2.45 million gallons daily.

30. Three commentors directly or indirectly inquired as to why there was no response to Dr. Ian Nisbet's data, which concluded in part:

"In my opinion, the reports of PCBs in Schweitzer Well No. 3 should not be accepted unless they are confirmed by comparably careful sampling and analytical techniques, including the use of blank samples." (EOEA, MAS, CLF)

Response:

Dr. Nisbet's final report is included in Appendix B in its entirety. We consider this data to serve as further evidence of the inconclusiveness as to the presence of PCBs and the risks involved in further developing the Woods Pond aquifer.

Close examination of the data reveals an apparent mathematical error in calculating the PCB concentration of the "Blank" sample. The concentration should have been reported as 80 ppt instead of 1.2 ppt. This would give the "Blank" sample the highest concentration of PCBs of the six samples tested.

31. Comment: The information presented in the draft EIS, however, is insufficient to determine the degree to which a different combination of measures might have reduced the extent of property damage. The report does not present information on the degree to which each of the structural measures reduces the area subject to flooding for the 1-percent chance event.

The section on ALTERNATIVES, shows that nonstructural measures were considered as components only in Alternative V. Presentation of the increments of protection afforded by each component measure relative to the area impacted by the 1-percent flood in each alternative in the final EIS will improve this agency's ability to make a determination on the degree to which this project is consistent with adopted NERBC policy.

Response: We believe the inclusion of the material on pages 1 and 2 partially responds to these comments. Going further, however, the comment fails to mention an adequate "level of protection," which in this case must include the elimination of the risk for loss of life. Given this criteria and the conditions cited on pages 1 and 2, certain measures or combination of measures would just not do the job.

We also feel that a wide range of components has been presented in the Alternative. For instance, the following components are included in one or more alternatives: flood insurance, flood plain regulation, channel work, single-purpose flood prevention structure, multiple-purpose flood prevention and recreation structure, relocation, or a combination of measures. Each alternative is compared to the selected plan in terms of costs and environmental effects. We believe that the decisionmakers are provided with adequate data to enable them to judge the merits of each alternative and the selected plan.

The sole use of nonstructural measures or even a "primarily" nonstructural plan would not be cost-effective along Washington Mountain Brook.

32. Comment: We also note that on page C-1, Appendix C, the discount rate used to calculate average annual costs for the project was 3 1/4 percent. It is our understanding that the rate required by the U.S. Water Resources Council for federal projects for FY 1980 was 7 1/8 percent.

Response: Refer to response to comment #9.

Berkshire County Regional Planning Commission

33. Comment: It is quite possible that the WMB project's estimated average annual water supply benefit of $114,600 (1979) is a conservative figure. Unfortunately, the EIS gives little explanation of how that figure was calculated, but given the importance of public water supply for fire protection; health; residential, industrial and commercial development; recreation; and aesthetics the value of the water supply benefits could be justifiably estimated at significantly more that the listed figure. That would increase the net project benefits. Furthermore, if Lenox is to receive water from WMB, then the benefits to Lenox will be substantial, a dollar figure that could be added to the project's net benefits.

Response: In 1977, prior to the current environmental review, it was believed that if the USDA withdrew support for this project, that Lee would pursue to build a single-purpose water supply development on Washington Mountain Brook. At that time, it appeared to be the "most likely" alternative for water supply to the PL83-566 watershed project.

However, it has become apparent, as a result of the environmental review, that if the Washington Mountain Brook project is unacceptable (not because of withdrawn support), that any plans Lee might pursue along the same course would also be unacceptable. Therefore, Lee and Lenox must identify another "most likely" alternative aside from the planned project.

The responses received from Lee and Lenox clearly indicate the Washington Mountain Brook to be the only mutually beneficial alternative for a regional supply.

Lee has indicated a preference to develop the Greenwater Brook aquifer to meet its own needs; while Lenox has indicated it will pursue either the Vahle site or Pleasant Valley site. Both of Lenox choices are surface water sites of the same relative cost.

SCS is now basing the water supply benefits (since the existence of the Lee-Lenox agreement) on these two "most likely" alternative courses of action. See response to comment #15 regarding procedure used to determine annual cost and benefits.

Department of Commerce

34. Comment: The DEIS addresses the flood problems of the community and non-structural alternatives, but does not reference flood warning systems in the solutions offered. As part of the structural solution proposed, a flood warning system of the type described in the enclosure should be considered. It would be an oversight not to include a warning system either as a nonstructural alternative and/or companion item.

Flash flood watches and warnings for this area are issued as a routine NWS service by the Forecast Office in Boston, Massachusetts. Flood forecasts for the Housatonic River are prepared by the NWS River Forecast Center in Hartford, Connecticut.

Response: The short hydrologic response time of the watershed and the type of flooding that usually occurs, would only allow use of the generalized flash flood watch and warning system. Flash flood watches and warnings for this area are issued by the Forecast Office of the National Weather Service, in Boston. They are routinely broadcast by local radio stations when issued. It is felt that with installation of the preferred plan, together with an awareness of potential flooding from the radio broadcasts, no further warning program is necessary.

Department of Health and Human Services

35. Comment: The two proposed permanent sediment control structures in Washington Mountain Brook "... will be designed to trap approximately 7,600 cubic yards of sediment (all material greater than 6 inches in size) during a 100-year flood." Yet, the current estimated volume of deposition fo a 100-year flood would be in excess of 26,000 cubic yards. What benefit if any would these two sediment control facilities offer the town of Lee if a 100-year or greater flood event occurred and more than 18,000 cubic yards of gravel, boulders, etc., were bypassed to the town?

Response: The two sediment control structures are to serve two major functions.

First, they are needed to prevent the channel from breaching during the 100-year flood. Total estimated sediment from the watershed, without the upstream dams is 26,000 cy. With the dams in place, this total will be reduced to 19,500 cy delivered at the alluvial fan. This sediment will consist of all sizes of material ranging from suspended fines to boulders several feet in diameter. When this sediment reaches the alluvial fan where slopes are flatter and velocities are less, the large material can no longer be transported and will be deposited in the channel. This deposition will block the channel and divert the flood flows out onto the alluvial fan causing extensive flooding and damage. To prevent this deposition, the two sediment control structures were designed to trap most of the material above 6 inches in size. Studies indicate that most of the sediments under 6 inches will be transported through the alluvial fan during the peak flows of the 100-year flood. Investigations show that about 39 percent or 7,600 cy of the 19,500 delivered to the fan will be over 6 inch size material.

Secondly, the present average annual volume of sediment delivered to the alluvial fan is about 9,100 cy. Of this volume, about 4,100 cy are deposited each year. With the upstream floodwater retarding structures, the volume of sediment delivered to the alluvial fan will be reduced to average 4,000 cy per year, with about 1,800 cy deposited The remaining 2,200 cy will be fine and suspended material, which will move downstream, causing little aggradation in the stream channel. Th is in contrast to the 5,000 cy/year presently being passed downstream.

36. Comment: The potential for development in the 36 acres of benefited flood plain should be described. If development was to occur in this area, to what extent would flood damages be aggravated from a storm event greater than 100-years? Examination of Figures 23 and 24 reveals flood damage along a portion of Washington Mountain Road that is outside of the present 100-year flood area (Figure 25 Flood Hazard Map). Were there other areas in Lee subject to damage outside of the 100-year flood plain? Has any consideration been given to possibly adding a relocation plan of the more flood-prone structures to the preferred plan?

Response: First of all, there are several other areas within Lee that are subject to flooding and damage from other sources. These areas have recently been identified in a Flood Insurance Study.

Secondly, adding a relocation plan of the more flood-prone structures to the preferred plan was not considered, since there is no remaining damage to these structures for floods up to 1-percent chance (100-year). Also, the relocation component of the non-structural alternative was not cost-effective.

The flood plain area benefited does have a developmental potential based solely on present land use. However, the preliminary flood boundary maps of the Flood Insurance Study do not propose a floodway for Washington Mountain Brook. This is a reflection of the hazard involved, and therefore community officials should restrict any further development within the 100-year flood plain, which was determined to include the entire alluvial fan.

37. Comment: According to Appendix D of the EIS, phosphorus loadings to the proposed lakes should not be increased by land use changes or increased human activity in the watershed above. Recommendations are also made discouraging the installation of septic systems and shoreline development. For these reasons, we believe efforts should be made to develop and implement a water quality management plan to protect the future water quality for Washington Mountain Lake, October Mountain Lake, and Schoolhouse.

Response: The suggestion of a water quality management plan is very appropriate. The SCS will take the initiative, and together with the Massachusetts Divisions of Forests and Parks, and Fisheries and Wildlife, and the town of Lee, will develop and implement a water quality management plan for each of the three lakes.

LIST OF PREPARERS

Following is a listing of the key personnel who were directly responsible for significant input in the preparation of this Environmental Impact Statement.

NAME	PRESENT TITLE (Time in Job-Yrs.)	EDUCATION Degree(s)	OTHER EXPERIENCE (Titles & Time in Job-Yrs.)
SCS Water Resources Planning Staff			
William M. Fennell	Planning Engineer (11)	BS - Agricultural Engineering	Civil Engineer 10 yrs. Engineering Specialist 2 yrs.
Donald W. Haley	Hydraulic Engineer (5)	BS - Agricultural Engineering	Civil or Agricultural Engineer 6 yrs.
Michael R. Kolman	Agricultural Economist (2)	BA, MA - Economics	Economist 2 yrs.
Luther F. McDougal	Supervisory Hydraulic Engineer (5)	BS - Agricultural Engineering	Area Engineer (Civil) 6 yrs. Hydraulic Engineer 12 yrs.
John L. O'Neill	Agricultural Economist (6)	BS - Agricultural & Food Economics	
John A. Tibbetts	Hydraulic Engineer (1)	BS - Civil Engineering	Civil Engineer (Design) 8 yrs.
James A. Wesoloski	Civil Engineer (9)	BS, MS - Civil Engineering	Project Engineer 2 yrs.
SCS State Office Staff			
Robert W. Franzen	State Biologist (8)	BS, MS - Biology (Wildlife)	Biologist 7 yrs.
Peter G. Waldo	Geologist (6)	BA, MS - Geology	

LIST OF PREPARERS - cont.

NAME	PRESENT TITLE (Time in Job-Yrs.)	EDUCATION Degree(s)	OTHER EXPERIENCE (Titles & Time in Job-Yrs.)

Consulting Firms & Individuals

Name	Contribution
EcolSciences, Inc. 133 Park Street, NE Vienna, Virginia 22180	Environmental Assessment
John Pretola, Archaeologist Springfield Science Museum	Archaeological Survey
Tighe and Bond/SCI Consulting Engineers and Environmental Specialists	Municipal Water Supply Evaluations Lee
J. F. Moynihan & Associates Engineering Consultants	Municipal Water Supply Evaluation Lenox

The EIS was reviewed and concurred in by the Soil Conservation Service, state staff specialists having responsibility for engineering, soils, agronomy, conservation land treatment, and geology. This review was followed by a review of the document and supporting data by the Northeast Technical Service Center.

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APPENDIX A

PLANNED PROJECT (Selected Plan)

Economic Summary

The primary benefits and costs ascribed to each aspect of the planned project are shown in the following tables. The data can also be used for the purpose of comparing alternatives with the planned project.

Costs: ($)

	Initial Costs	Average Annual Costs[1/]				
		Flood Prevention	Water Supply	Recreation	Non Allocated	Total
October Mountain Lake	1,006,800	6,970	21,110	15,240	4,110	47,430
Schoolhouse Lake	1,238,400	20,400	24,380	--	5,580	50,360
Channel Work	420,600	14,250				14,250
Washington Mountain Lake	200,000			14,830		14,830
Water Supply Facilities[3/]	7,105,000		376,720			376,720
Total	9,970,800	41,620	422,210	30,070	9,690	503,590

Benefits: ($)

	Average Annual Benefits					
	October Mountain Lake	Schoolhouse Lake	Water Supply Facilities	Channel Work	Washington Mountain Lake	Total
Flood Prevention[2/]						82,780
Water Supply						647,900
Recreation	24,300	--	--	--	70,560	94,860
Total						825,540
Net Average Annual Benefit:					Plus	321,950

1/ Amortized @ 3 1/4 percent as required by U.S. Senate Document 97. The discount period is 100 years. Nonallocated costs represent costs of administration.

2/ The flood prevention and sediment control measures are interdependent, and function as a unit or system. Does not include flood prevention benefits from Washington Mountain Lake.

3/ Includes Pipelines, Intakes and Chlorinator, Treatment Plant, Storage Tanks.

Recreation Benefits

Recreation benefits were based on pool fishing only. Benefits were claimed at Washington Mountain Lake and October Mountain Lake. The rationale for including recreation benefits at Washington Mountain Lake is that the structure in its existing state does not store water permanently and will not until land rights (i.e., telephone cable relocation) have been completely obtained. These land rights have been included as a project cost in the Benefit/Cost analysis.

Benefits were calculated by determining annual user days expected at the sites and multiplying this figure by the appropriate value for this recreational activity. The 1978 Statewide Comprehensive Outdoor Recreation Plan (SCORP) prepared by the Massachusetts Department of Environmental Management indicates the average number of fishing user days annually supplied by 1 acre of open water in nonurban areas is 66.1. Actual figures for use at PL-566 projects east of the Mississippi River show this figure to be 67 user days per acre annually; in the northeast the figure is 173 user days per acre annually. For the Washington Mountain Brook sites a figure of 60 was used. When applying this number to acreages of open water at each site, the following annual use was calculated for each site.

Site	Acres	User Days
Washington Mountain Lake	224	13,440
October Mountain Lake	90	5,400

Dollar Benefits were calculated as follows:

Site	Type of Fishery	Value per User Day	User Days	Total Value
Washington Mountain Lake	Cold & Warm Water	$5.25	13,440	$70,560
October Mountain Lake	Cold & Warm Water	4.50	5,400	24,300
Total			18,840	$94,860

Water Supply Benefits

Municipal water supply is considered to be economically justified if it supplies water at no greater cost than the least expensive most likely alternative that would be used in the absence of the project. In the absence of the planned project there is no alternative which Lee and Lenox would likely pursue mutually, to develop a regional supply.

Information provided by the town's consultants indicate that Lee would pursue a ground water alternative at Greenwater Brook and Lenox would obtain its supply by constructing a surface water reservoir at the Vahle site. The following table compares the costs of these alternatives with planned project costs.

	Average Annual Costs[1/]			
	Lee Greenwater Brook Ground Water	Lenox Vahle Site	Total Lee and Lenox	Planned Project
Installation	158,960	152,050	311,000	271,110
Operation and Maintenance	258,000	78,900	336,900	151,100
	416,960	230,950	647,900	422,210

1/ Amortized at 3 1/4 percent for 100 years - Price Base 1980.

The difference between the least cost alternative and next least cost, most likely alternative is considered to be the net benefit. Net benefits resulting from the above cost data are $225,690.

Land Rights Costs

A. October Mountain and Schoolhouse Lake

Land necessary for October Mountain Lake is 120 acres and for Schoolhouse Lake 75 acres. Land rights costs for October Mountain Lake and Schoolhouse Lake were based on opportunity costs which represent the value of benefits foregone through project implementation. Existing benefits which would be lost at these sites were (1) recreation use (a reflection of the amenity value), and (2) sustained timber production. Actual day use figures at October Mountain State Forest from 1970 through 1976 were used to determine an average annual recreation use of 2.72 user days/per acre. This use figure was then applied to acreages to be lost at each site and the annual value capitalized at 3 1/4 percent for the project evaluation period of 100 years. The value of a user day for hiking and nature study was set at $2.25, the maximum value based on Water Resources Council standards. This analysis indicated the lost value of recreation to be about $200 per acre.

Sustained timber yield over the evaluation period was estimated to be 76.4 board feet per acre annually. Although this figure is double the present allowable cut according to the Massachusetts Division of Forests and Parks, indications are that with proper management, this

goal will be reached in the future. The value used for timber harvested was estimated at $65 per 1,000 board feet. The analysis was made in the same manner as that for recreation with the final result showing the value of timber lost to be approximately $145/acre.

The resulting existing land rights value was estimated at about $345 per acre.

B. Washington Mountain Lake

The only remaining land rights cost at this site is for relocation of 3,100 feet of telephone cable. This relocation is necessary in order to facilitate the impoundment of a permanent pool for fishing. The cable is presently owned by the American Telephone & Telegraph Company. The most recent estimated cost for cable relocation is $200,000.

C. Channel Work

Land rights for the channel work consists of the fee simple purchase of approximately 2 acres (for sediment control facilities), and the purchase of construction and access easements (at each of the two facilities and at Mill Street) where channel work will be conducted. The estimated cost for fee simple purchase is $2,500 per acre or $5,000. The cost of easements is estimated at $500 each for a total of $1,500.

Flood Damage Reduction Benefits

With the exception of Mill Street road and bridge damage, flood prevention benefits claimed in Reaches 1 and 2 reflect only damage reduction upstream of the common flood plain of Washington Mountain Brook and the Main Stem Housatonic River. The decision to claim damage reduction for Mill Street was based on the fact that damages here are function of the high velocities of Washington Mountain Brook and that with the project in effect these damages would be eliminated. Flood damage at the Mill Street bridge and adjacent road from the Main Stem Housatonic only, would be insignificant due to low velocities associated with backwater conditions. Damages by reach and type with and without project are shown on the following table.

AVERAGE ANNUAL FLOOD DAMAGES AND DAMAGE REDUCTION BENEFITS FROM PLANNED PROJECT[1/]

Washington Mountain Brook Watershed, Massachusetts

		Damages ($)								
		Without Project			With Project			Benefits		
Reach	Type	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
1	Residential	550	80	630	0	0	0	550	80	630
	Road & Bridge	18,030	3,610	21,640	0	0	0	18,030	3,610	21,640
	Sediment & Debris	11,700	590	12,290	2,610	130	2,740	9,090	460	9,550
	Utility	70	10	80	0	0	0	70	10	80
	Subtotal	30,350	4,290	34,640	2,610	130	2,740	27,740	4,160	31,900
2	Residential	1,790	270	2,060	0	0	0	1,790	270	2,060
	Road & Bridge	32,690	6,540	39,230	620	120	740	32,070	6,420	38,490
	Sediment & Debris	9,930	500	10,430	2,210	110	2,320	7,720	390	8,110
	Utility	1,850[2/]	370	2,220	0	0	0	1,850	370	2,220
	Subtotal	46,260	7,680	53,940	2,830	230	3,060	43,430	7,450	50,880
	Grand Total	76,610	11,970	88,580	5,440	360	5,800	71,170	11,610	82,780

1/ Price Base December 1980.
2/ Includes damage to water intake above Newton Bridge.

February 1981

REMAINING PLANNED PROJECT INSTALLATION COST

Washington Mountain Brook Watershed, Massachusetts
(Dollars)[1/]

ITEM	Installation Cost PL-566 Funds			Installation Cost - Other Funds				Total Installation Cost
	Construction	Engineering	Total PL-566	Construction	Engineering	Land Rights	Total Other	
Washington Mountain Lake	-	-	-	-	-	200,000	200,000	200,000
October Mountain Lake	277,900	82,900[2/]	360,800	443,900	42,900[2/]	37,900	524,700	885,500
Schoolhouse Lake	494,300	59,300	553,600	447,300	53,700	19,000	520,000	1,073,600
Channel Work	326,400	39,000	365,400	-	-	600	600	366,000
Water Supply Pipeline, Intakes & Chlorinator Treatment Plant and Storage Tank	-	-	-	4,964,900	886,600	12,300	5,863,800	5,863,800
Subtotal	1,098,600	181,200	1,279,800	5,856,100	983,200	269,800	7,109,100	8,388,900
Project Administration	-	-	313,800	-	-	-	1,268,100	1,581,900
GRAND TOTALS			1,593,600				8,377,200	9,970,800

1/ Price Base 1980
2/ Includes costs already incurred at "Original Site" (Supplement No. 2).

April 1980

Project benefits and costs are displayed below using an interest rate of 7 1/8 percent. This is in response to comments during the EIS review period. Seven and one-eighth percent is the Water Resources Council interest rate which was in effect for FY 1980. The draft EIS was prepared in June 1980.

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osts: ($)

	Initial Costs	Average Annual Costs[1/]				
		Flood Prevention	Water Supply	Recreation	Non Allocated	Total
tober Mountain Lake	1,006,800	13,830	35,600	27,040	8,650	85,120
hoolhouse Lake	1,238,400	41,500	43,470	--	11,750	96,720
annel Work	420,600	29,950				29,950
shington Mountain Lake	200,000			22,310		22,310
ter Supply Facilities[3/]	7,105,000		642,730			642,730
Total	9,970,800	85,280	721,800	49,350	20,400	876,830

nefits: ($)

	Average Annual Benefits					
	October Mountain Lake	Schoolhouse Lake	Water Supply Facilities	Channel Work	Washington Mountain Lake	Total
ood Prevention[2/]						82,780
ter Supply						991,630
creation	24,300	--	--	--	70,560	94,860
Total						1,169,270
t Average Annual Benefit:					Plus	292,440

1/ Amortized @ 7 1/8 percent. The discount period is 100 years. Non-located costs represent costs of administration.

2/ The flood prevention and sediment control measures are interdependent, d function as a unit or system. Does not include flood prevention benefits om Washington Mountain Lake.

3/ Includes Pipelines, Intakes and Chlorinator, Treatment Plant, Storage nks.

Net Employment

Employment resulting from the project has been calculated in regards to construction only. Detailed analysis of bid schedules for project measures indicates that approximately $900,000 of construction costs will be associated with labor. At an average annual wage of $18,000 this translates into about 50 man-years employment resulting directly from project construction.

Secondary Benefits

Secondary benefits were not used for project justification and are not included in Benefit-Cost analysis tables in this report. These benefits represent both indirect and induced effects of the project. Indirect effects are the increased net returns which result from economic activity stimulated by production, utilization, and disposition of intermediate goods or services created by the project. Induced effects are increased net returns which result from economic activities stimulated by consumer spending or wages and income earned from direct and indirect activity created by the project. The most accurate method commonly used for estimating secondary benefits is through an input-output analysis. This analysis determines how business activity in any form generates other business activity. Because of the time and expense involved in developing this type of analysis for a specific location, an analysis is not available for this particular watershed. However, as a general rule, based on other study areas and projects, the Soil Conservation Service estimates that secondary benefits will equal approximately 10 percent of flood prevention and recreation direct primary benefits or $16,600. This figure represents only an approximation of business activity stimulated by the project.

SUPPLEMENTAL WATERSHED PLAN #4

for the

WASHINGTON MOUNTAIN BROOK WATERSHED

Berkshire County, Massachusetts

June 1980

WASHINGTON MOUNTAIN BROOK WATERSHED

SUPPLEMENTAL WATERSHED PLAN AGREEMENT NO. 4

between the

Town of Lee
Local Organization

Berkshire Conservation District
Local Organization

Massachusetts Department of Environmental Management
(Formerly Department of Natural Resources)
Local Organization

Massachusetts Water Resources Commission
Local Organization

(hereinafter referred to as the Sponsors)

Commonwealth of Massachusetts

and the

Soil Conservation Service

United States Department of Agriculture

(hereinafter referred to as the Service)

Whereas, the Watershed Plan Agreement for the Washington Mountain Brook Watershed, Commonwealth of Massachusetts, executed by the Sponsors named therein and the Service, became effective on the 1st day of April 1969; and

Whereas, Supplemental Watershed Plan Agreements No. 1, No. 2, and No. 3 for the Washington Mountain Brook Watershed, Commonwealth of Massachusetts, executed by the Sponsors named therein and the Service, became effective on the 31st day of December 1969, the 16th day of July 1971, and the 18th day of May 1973, respectively; and

Whereas, in order to carry out the watershed plan for said watershed, it has become necessary to modify said Watershed Plan Agreement, as supplemented; and

Whereas, it has been found necessary to modify the watershed plan as supplemented by: changing the storage volumes, multiple-use, and allocation and sharing of costs for the Schoolhouse Lake Structure (Site 4); changing the management of the water supply storage in the October Mountain Lake Structure; substituting sediment control facilities (debris basins) for the streambank protection measures in Reach 3; and to reaffirm the economic feasibility of the project; and

Whereas, a Supplemental Watershed Plan which modifies the watershed plan dated August 1967 for said watershed has been developed through the cooperative efforts of the Sponsors and the Service; which plan is annexed to and made a part of this agreement;

Now, therefore, the Sponsors and the Service hereby agree upon the following modifications of the terms, conditions, and stipulations of said Watershed Plan Agreement, as supplemented:

1. Paragraph numbered 1 is modified to read as follows:

   The Sponsors will acquire with other than PL-566 funds, such land rights as will be needed in connection with the works of improvement. These costs will be borne by the Sponsors as follows:

Works of Improvement	Massachusetts Department of Environmental Management (percent)	Town of Lee (percent)	Estimated Cost (dollars)
Washington Mountain Lake	100	0	270,550 1/
October Mountain Lake	100	0	37,200
Schoolhouse Lake	0	100	23,200
Channel Work	0	100	7,200
Water Supply Pipeline	0	100	2/

1/ Includes $70,550 expenditure at completed site.
2/ Assumed to be on existing rights-of-way.

The Sponsors agree that all land acquired or improved with PL-566 financial or credit assistance will not be sold or otherwise disposed of for the evaluated life of the project except to a public agency which will continue to maintain and operate the development in accordance with the Operation and Maintenance Agreement.

2. Paragraph number 3 is modified, except with respect to the Washington Mountain Lake Structure, to read as follows:

The percentages of construction costs for structural measures to be paid by the Sponsors and by the Service are as follows:

Works of Improvement	Massachusetts Water Resources Commission (percent)	Town of Lee (percent)	Service (percent)	Estimated Construction Cost (dollars)
Schoolhouse Lake	0	47.6	52.4	840,000
Intake	0	100	0	53,000
October Mountain Lake	61.5	0	38.5	643,900
Chlorinator-Intake	100	0	0	53,000
Channel Work	0	0	100	291,200
Water Supply Pipeline	0	100	0	534,000

3. Paragraph numbered 4 is modified, except with respect to the Washington Mountain Lake Structure, to read as follows:

The percentages of the engineering costs to be borne by the Sponsors and the Service are as follows:

Works of Improvement	Massachusetts Water Resources Commission (percent)	Town of Lee (percent)	Service (percent)	Estimated Engineering Cost (dollars)
Schoolhouse Lake	0	47.6	52.4	100,800
Intake	0	100	0	6,350
October Mountain Lake				
Present Structure	43.7	0	56.3	74,200
Original Structure	15.2	0	84.8	38,000
Chlorinator-Intake	100	0	0	6,350
Channel Work	0	0	100	34,900
Water Supply Pipeline	0	100	0	67,300

4. Paragraph number 5 is modified to read as follows:

The Sponsors and the Service will each bear the costs of Project Administration which it incurs, estimated to be as follows: Massachusetts Water Resources Commission $28,600, town of Lee $119,600, and the Service $374,100.

5. Paragraph numbered 6 is modified to read as follows:

The Sponsors will be responsible for the operation, maintenance, and replacement of the works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

These responsibilities are as follows:

Works of Improvement	Sponsor
All Multiple-Purpose Structures	Massachusetts Water Resources Commission
All Water Supply Facilities	Town of Lee
Channel Work	Town of Lee

6. Paragraph numbered 7 concerning operation and maintenance of the water supply facilities is now included in the preceding paragraph numbered 5.

7. Paragraph numbered 8 is modified to read as follows:

The Sponsors agree that the municipal water supply storage will be withdrawn from October Mountain Lake and used for municipal water supply only during the months of December through March, until such time when the local demand for water increases to a level which warrants a change in management to allow year-round use of the water supply storage. Continued recreational use of the reservoir is assured by the town of Lee, as the municipal water will be appropriately treated. The watershed areas and reservoirs of October Mountain Lake and Schoolhouse Lake will be managed in accord with appropriate public health regulations.

A separate agreement will be entered into between the Town of Lee and the Massachusetts Department of Environmental Management on an exchange of values for dedicated forest lands utilized for municipal water supply.

8. Paragraph numbered 14 is added to read as follows:

This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

9. The Sponsors and the Service further agree to all other terms, conditions, and stipulations of said Watershed Plan Agreement, as supplemented, not modified herein.

10. Paragraphs numbered 2, 9, 10, 11, 12, 13, and 15 remain unchanged, or as modified by previous supplemental agreements. These provisions are included here for clarity.

2. The Sponsors will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of works of improvement.

9. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

10. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed plan is contingent on the appropriation of funds for this purpose.

A separate agreement will be entered into between the Service and the Sponsors before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

11. The watershed plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto.

12. No member of or delegate to Congress, or resident commissioner shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

13. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964 and the regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.12), which provides that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any activity receiving federal financial assistance.

15. The Sponsors assure that comparable replacement dwellings will be available for individuals and persons displaced

from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsors and the Service as follows:

Relocation Payments	Sponsors (percent)	Service (percent)	Estimated Relocation Payment Costs (dollars)
Relocation Payments	45.3	54.7	0 1/

1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any persons, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with percentages shown.

TOWN OF LEE

By Marea L. Bettega

Title Chairman

Address Main St Lee 01238
Zip Code

Date July 30, 1979

The signing of this agreement was authorized by a resolution of the Board of Selectmen of the Town of Lee adopted at a meeting held on July 30, 1979

William M. Murphy Selectm.
(Title)

Address Main St., Lee 01238
Zip Code

Date July 30 1979

****

BERKSHIRE CONSERVATION DISTRICT

By Frederick Turner

Title Chairman

Address Great Barrington 01230
Zip Code

Date Aug 9 1979

The signing of this agreement was authorized by a resolution of the governing body of the Berkshire Conservation District adopted at a meeting held on August 9, 1979.

Henry Jaeschke
(Secretary, Berkshire Conservation District)

Address Adams, Mass. 01220
Zip Code

Date August 9, 1979

****

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

By Richard E. Kendall

Title Commissioner

Address 100 Cambridge St., Boston, Ma. 02202
Zip Code

Date July 9, 1980

MASSACHUSETTS WATER RESOURCES COMMISSION

By Richard S. Kendall

Title Co-Chairman

Address 100 Cambridge St., Boston, Ma

Date July 9, 1980

The signing of this agreement was authorized by a resolution of the Massachusetts Water Resources Commission adopted at a meeting held on Aug. 13, 1979

(Secretary, Massachusetts Water Resources Commission)

Address 100 Cambridge St., Boston, Ma

Date July 9, 1980

****

SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

By

Title State Cons.

Address 451 West St, Amherst

Date 7/10/80

SUPPLEMENTAL WATERSHED PLAN #4

WASHINGTON MOUNTAIN BROOK WATERSHED

Berkshire County, Massachusetts

June 1980

INTRODUCTION

The purpose of this supplemental plan is to:

1. Change the multiple-purpose use and storage volumes of the Schoolhouse Lake Structure (Site 4), and revise the cost allocation and cost sharing to reflect these changes;

2. Change the management of the water supply storage in the October Mountain Lake Structure;

3. Change the channel work[1/] to delete the streambank protection measure, add sediment control facilities (debris basins) and define additional needs for sediment and debris removal; and

4. Reaffirm the economic feasibility of the project by updating costs and benefits.

Only those features of the plan which have been modified are presented herein, unless otherwise noted.

A recent study by the town of Lee's engineering consultant showed that future water supply needs could not be met by present sources and the October Mountain Lake development provided for in the original watershed plan, as supplemented. The consultant evaluated needs through the year 2020 and alternatives for meeting these needs which included development of ground water and surface water sources. It was concluded by the consultant that multiple-purpose development (flood prevention plus water supply) of the Schoolhouse Lake Site in addition to changing the schedule for use of the water supply storage in the presently planned October Mountain Lake Site is the most economical and feasible means of providing the desired yield of 2.45 million gallons per day (MGD).

The Schoolhouse Lake structure will include 620 acre-feet for municipal water supply in place of the 105 acre-feet for recreation use shown in the original plan, as supplemented. Table 3 shows the revised structural data for the Schoolhouse Lake structure.

1/ Included in the original plan as Streambank Protection and Channel Improvement.

The change in beneficial use and in storage volumes of the Schoolhouse Lake structure required revising the cost allocations and the cost sharing of construction and engineering costs. Tables 2 and 2A have been revised accordingly.

Attaining the yield of 2.45 MGD will require year-round use of the water supply storage in October Mountain Lake. The original watershed plan schedules withdrawal only during the months of December through March. Year-round use would yield 0.88 MGD to supplement the safe yield of 1.57 MGD from Schoolhouse Lake.

A more detailed study of the unstable streambanks in Reach 3 has shown that the streambank protection measures in the original plan would not be adequately effective, and that an acceptable solution for stabilization cannot be formulated. Partial stabilization will result from reduction of peak flood flows by the upstream structural measures. However, significant amounts of sediment and other debris would still be produced and moved into downstream reaches to reduce the flow capacity of the stream channel and bridges. In response to this problem, the installation of sediment control facilities has been added as an element of the channel work. The sediment control facilities will reduce the downstream movement of materials, thereby maintaining the capacity of the stream channel and bridges.

Because of the continuing streambed aggradation, other changes in the channel work, as outlined in the original watershed plan, were found to be needed. These changes consist of adding sediment and debris removal from the Washington Mountain Road and Newton bridges and from channel areas in the downstream reaches.

The channel work as now planned will provide adequate capacity to pass the 100-year frequency flood (with floodwater retarding structures installed) without damages to existing development on the flood plain.

WORKS OF IMPROVEMENT TO BE INSTALLED

Structural Measures

Multiple Purpose Structures

The Schoolhouse Lake structure will now provide a total storage capacity of 1304 acre-feet, with 649 acre-feet for floodwater, 620 acre-feet for municipal water supply and 35 acre-feet for sediment accumulation.

The dam will be constructed of compacted earthfill with a maximum height of 63 feet. The surface of the dam will be protected with rock riprap. A vegetated earth emergency spillway will be installed on the right

abutment. Other appurtenances include a principal spillway, pool drain with gate, and a gated water supply intake. The principal spillway will be designed to provide a release of 0.1 cubic feet per second (cfs) from the colder bottom level of the permanent pool.

The permanent pool will be cleared of trees and brush. Where the pool depth is 3 feet or less, all trees and brush will be cut flush with the ground. In the deeper water areas, 12-inch (maximum height) stumps will be left. Cleared material will be disposed of in a manner acceptable to the Massachusetts Division of Air Pollution Control.

A 16-inch pipeline will be installed by the town of Lee to transmit water from Schoolhouse Lake and October Mountain Lake to the town's Upper Reservoir on Codding Brook. The 2.9 mile long pipeline will follow Washington Mountain Road for about 2.0 miles, then cross country to the Upper Reservoir.

The management of October Mountain Lake will be changed to allow year-round use of the water supply storage when warranted by the need for additional yield. The required water treatment will be provided to permit continued recreational use of the permanent pool.

The watershed areas and reservoirs of October Mountain and Schoolhouse Lakes, which are totally within the October Mountain State Forest, will be managed according to appropriate public health regulations for surface water supplies.

Channel Work

Although only certain elements of the channel work are changed by this supplement, all elements are discussed in the following because of their interrelationship and for clarity.

The channel work will now consist of:

1. Removal of sediment and debris from the bridge openings of all bridges in Reaches 1 and 2 as necessary. (Conrail Railroad, Mill Street, Washington Mountain Road, Woodland Street and Newton Bridge).

2. Construction of a concrete channel between the Conrail Railroad and Mill Street bridges, including concrete paving of the bridge floors.

3. Installation of riprap wingwalls at the entrance to the Mill Street bridge.

4. Clearing and shaping the channel immediately upstream of Mill Street for a distance of about 100 feet.

5. Removal of sediment and debris from the stream channel within Reaches 1 and 2 at locations where the 100-year flood is to be confined to the stream channel. The appropriate locations and required volumes of sediment to be removed will be determined by onsite inspections following installation of upstream structures. This volume is currently estimated to be between 100-300 cubic yards.

6. Construction of sediment control facilities above Newton Bridge with a combined capacity of approximately 7,600 cubic yards.

The design of the channel and modifications to bridge openings is to be based on the capacity to safely pass the peak flood flow of the 100-year flood with the completion of the upstream floodwater retarding structures. The channel work at Mill Street will consist of removal of sediment and debris to design grade and installation of approximately 50 feet of reinforced concrete channel between the Conrail Railroad bridge and the Mill Street bridge. This vertical-walled channel will vary from 28-20 feet in width, the respective widths of the Mill Street and railroad bridges. In addition, the bridge floors (streambed) will be paved with concrete. New riprap wingwalls will be installed at the entrance to the Mill Street bridge, and the channel will be cleared and shaped for a distance of about 100 feet upstream. The combined effect of this channel work is to improve the hydraulic characteristics of the two bridges thereby reducing head losses and flood stages. In this channel work area, Washington Mountain Brook is a perennial, previously modified stream.

Channel work in Reach 3 will consist of installation of sediment control facilities in the lower portion above Newton Bridge. These facilities will be designed to trap approximately 7,600 cubic yards of sediment during a 100-year flood, or nearly all material greater than 6 inches. The threshold velocity through these facilities will be about 6 feet per second. The remaining sediment volume will pass through Reaches 1 and 2 with minimal deposition, since flows will be contained within the channel for the most part. Annual accumulation in the facilities is estimated to be about 1,800 cubic yards.

The sediment control facilities will consist of two systems with capacities of 6,000 and 1,600 cubic yards respectively. The control structures will be reinforced concrete, approximately 116 feet wide and projecting 5 feet above the streambed. The overall structure height will be about 8 feet. The upper system will employ two of these structures spaced about 177 feet apart. The lower system (1,200 feet downstream from the upper system and about 925 feet above Newton Bridge) will employ one structure with a concrete apron about 175 feet upstream of the structure. The apron is to identify the level or depth to which normal removal of debris should be confined (operation and maintenance).

The total volume of concrete for the three control structures and the apron is estimated at 600 cubic yards. The structures are designed to safely pass flows during the 100-year flood, with completion of the upstream floodwater retarding structures.

Debris removal and excavation will be required through approximately 400 feet of stream (200' and 200'), to accommodate the control structures and provide the storage capacity. This excavation will total about 18,000 cubic yards. Of this total, approximately 3,000 cubic yards will be used or disposed of onsite. The remaining 15,000 cubic yards will be serviceable material. This material will be stock piled, at the direction of the town of Lee, for future use.

Washington Mountain Road will serve as a construction and maintenance access road to the sediment control facilities. The road, to this point in the watershed, will not require extensive rehabilitation since it is presently used as an access to the water supply intake facilities on Washington Mountain Brook.

Although Washington Mountain Brook in the lower portion of Reach 3 is a perennial stream, it has been modified in the past by sediment excavations, stream realignment, and road construction. The sediment control facilities will not impound water during normal flows of 0.5 to 1.5 cubic feet per second per square mile of drainage (csm).

Installation Costs

The revised costs for installing the structural measures are shown in Tables 1 and 2. Table 2A shows a summary of the cost allocations and cost sharing for the structural measures.

Construction costs were updated, based on 1979 values and the engineering consultants final design for October Mountain Lake and preliminary designs for Schoolhouse Lake and the channel work. The actual contract cost was used for the completed structure, Washington Mountain Lake. The estimated construction cost and associated engineering service's cost for the water supply facilities were provided by the town of Lee's consultant. The engineering service's cost for Schoolhouse Lake includes an estimate of the cost of an engineering consultant's services.

Land rights costs were updated. For the land areas required for the multiple-purpose structures, land rights costs were based on opportunity costs which represent the value of benefits foregone through project implementation. Existing benefits which would be lost are recreation use and sustained timber production. The land rights cost for relocation of the telephone cable at Washington Mountain Lake was provided by the utility company. The land rights cost for the channel work is based on the fee simple purchase of land on which to construct the sediment control facilities and the purchase of construction and maintenance access easements for the facilities and other elements of the channel work.

For the multiple-purpose structures, the construction, engineering and land rights costs were allocated to the purposes served by the Use-of-Facilities Method.

The total installation cost of the structural measures is now estimated to be $4,250,100 of which PL-566 funds will provide $1,925,650 and other funds, $2,324,450. There is a net increase of about $45,000 in PL-566 construction costs due to the changes in scope of project measures presented in this supplement.

Sharing of project costs between PL-566 funds and other funds is in accordance with the provisions of PL-566, as amended, and existing policy.

EFFECTS OF WORKS OF IMPROVEMENT

The modified structural measures will provide the same degree of flood protection and about 95 percent of the activity days of recreation.

Development of Schoolhouse Lake to include storage for municipal water supply and changing the schedule of withdrawal from the storage in October Mountain Lake will provide a safe yield of 2.45 MGD for the town of Lee.

An increase of about 24 acres of forest land will be lost at Schoolhouse Lake due to the larger permanent pool. The uses of the contributing drainage area of Schoolhouse Lake may be limited because of public health considerations for the municipal water supply.

PROJECT BENEFITS

The direct annual monetary flood prevention benefits have been adjusted to reflect both the presence of the Washington Mountain Lake site and the increase in value of the facilities producing primary flood benefits (since 1967 when the damage surveys were made). These remaining annual flood prevention benefits shown in Table 5 are now estimated to be $69,300.

Annual water supply benefits, based on the installation of single purpose water supply reservoirs plus operation and maintenance costs, are estimated to be $114,600.

Recreation benefits resulting from the use of the Washington Mountain Lake and October Mountain Lake reservoirs are now estimated to be $63,240.

Total remaining annual monetary benefits from this project are estimated to be $247,140. In addition, secondary benefits were estimated to be equal to 10 percent of the direct flood prevention and recreation benefits or $12,300.

COMPARISON OF BENEFITS AND COSTS

The overall benefit-cost ratio for this project is greater than 1.3 to 1.0 with annual benefits in excess of $259,440 and annual costs of $200,000. Without secondary benefits of $12,300, the benefit-cost ratio is 1.2 to 1.0.

The comparison of remaining benefits and total costs are shown in Table 6. The remaining benefits exceed remaining and incurred costs, therefore total benefits are greater than total costs.

PROJECT INSTALLATION

This plan will be completed[1/] as a joint undertaking of local, state, and federal interests.

The Soil Conservation Service will provide all engineering services needed for the installation of structural measures, except for the water supply pipeline. These services will be provided by the town of Lee. The town of Lee will reimburse the Soil Conservation Service for that part of the engineering service's cost of Schoolhouse Lake allocated to municipal water supply and the total engineering service's cost for the water supply intake facility at Schoolhouse Lake.

Construction inspection will be provided by the Soil Conservation Service from federal funds for installation of the channel work and for those elements of the October Mountain Lake and Schoolhouse Lake structures on which federal construction funds are spent. The Service will also inspect all other elements during construction at October Mountain Lake and Schoolhouse Lake, which if improperly constructed, could adversely affect stability or functioning of those elements on which federal construction funds are spent. The town of Lee will provide construction inspection for the water supply facilities, as necessary, to protect its interests.

1/ Washington Mountain Lake Structure has been installed, except for relocation of the telephone cable. Final design, plans and specifications have been completed for the October Mountain Lake Structure.

Except for the water supply pipeline, the Massachusetts Water Resources Commission will act as contracting officer for the construction of all structural measures and administer all contracts as authorized by Chapter 651 of the Acts of 1968, General Court of the Commonwealth of Massachusetts. The Commission will also perform such inspection and other related work, and furnish such administrative and related services as it deems necessary to meet its responsibilities for project administration. The town of Lee will perform the contracting for the water supply pipeline.

Installation of the works of improvement, considering present conditions, will not displace persons, businesses or farm operations. If conditions change which would require such displacement, the watershed plan agreement will be supplemented as necessary to include provisions required to implement the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

A survey by a qualified archeologist shows no evidence of archeological resources that will be directly affected by installation of the project measures. If any discoveries are made during construction, actions taken will be in accord with SCS guidelines, 7 CFR 656, "Procedures for the Protection of Archeological and Historical Properties Encountered in SCS Assisted Programs," to comply with the Archeological and Historical Preservation Act (PL 93-291).

The channel work and water supply pipeline will be constructed after the multiple-purpose structures are installed.

PROVISIONS FOR OPERATION AND MAINTENANCE

The town of Lee will be responsible for the operation and maintenance of the channel work, the appurtenances at the October Mountain Lake and Schoolhouse Lake Dams related to water supply, (intakes and chlorinator) and the water supply pipeline.

An operation and maintenance agreement between the town of Lee and the Soil Conservation Service will be executed prior to issuing the Invitation to Bid for the channel work. Operation and maintenance of the channel work will include maintaining the structural integrity of the sediment control facilities and constructed channel, removal of sediment from the control facilities, removal of any sediment deposits in the constructed channel and at bridges, and maintaining access to the sediment control facilities.

The Sponsors and the Soil Conservation Service will inspect the dams and the channel work annually and after each major storm or unusual occurrence which might adversely affect the measures. The initial inspection of the dams will be performed during or immediately after the

initial filling of the reservoirs. Needed maintenance will be determined by the inspections. In conformance with state law, the Massachusetts Water Resources Commission is responsible to insure that needed maintenance is performed.

The water supply facilities will require maintenance and replacement, as necessary. This will be the responsibility of the town of Lee.

Maintenance work and work resulting from improper operation and maintenance are not eligible for PL-566 financial assistance. However, PL-566 funds may be used by the Soil Conservation Service to cost share for additional work on vegetative applications on completed measures, if the original vegetative application fails to establish through no fault of the contractor or those responsible for operation and maintenance. Also, PL-566 funds may be used by the Soil Conservation Service to cost share on repair work resulting from unknown conditions or design or construction deficiencies. The PL-566 cost share rate for the additional vegetative work or the repair work shall not exceed the rate authorized for the original work. Technical assistance that may be needed for maintenance work and work resulting from improper operation and maintenance will be provided by the Soil Conservation Service.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Washington Mountain Brook Watershed, Massachusetts

Installation Cost Item	Unit	No.	Estimated Cost (Dollars)[1/] PL-566 Funds	Other	TOTAL
LAND TREATMENT					
Forest Service					
Forest Land	Acre	680		4,900	4,900
TOTAL LAND TREATMENT				4,900	4,900
STRUCTURAL MEASURES					
Construction					
Multi-purpose Structures	No.	3	1,028,550	1,032,000	2,060,550
Channel Work[2/]			291,200	--	291,200
Water Supply Pipeline, Intakes, & Chlorinator			--	640,000	640,000
Subtotal Construction			1,319,750	1,672,000	2,991,750
Engineering Services			231,800	166,100	397,900
Subtotal Engineering			231,800	166,100	397,900
Project Administration					
Construction Inspection			169,200	124,400	293,600
Other			204,900	23,800	228,700
Subtotal Administration			374,100	148,200	522,300
Other Costs					
Land Rights			--	338,150	338,150
Subtotal - Other			--	338,150	338,150
TOTAL STRUCTURAL MEASURES			1,925,650	2,324,450	4,250,100
SUMMARY					
Subtotal SCS			1,925,650	2,324,450	4,250,100
Subtotal FS			--	4,900	4,900
TOTAL PROJECT			1,925,650	2,329,350	4,255,000

1/ Price Base 1979.
2/ Includes debris basins.

June 1980

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Washington Mountain Brook Watershed, Massachusetts
(Dollars)[1/]

ITEM	Installation Cost PL-566 Funds			Installation Cost - Other Funds				Total Installation Cost
	Construction	Engineering	Total PL-566	Construction	Engineering	Land Rights	Total Other	
Washington Mountain Lake	339,650[2/]	70,000	409,650	237,000[2/]	--	270,550	507,550	917,200
October Mountain Lake	247,900	74,000[3/]	321,900	396,000	38,200[3/]	37,200	471,400	793,300
Schoolhouse Lake	441,000	52,900	493,900	399,000	47,900	23,200	470,100	964,000
Channel Work	291,200	34,900	326,100	--	--	7,200	7,200	333,300
Water Supply Pipeline, Intakes & Chlorinator	--	--	--	640,000	80,000	--	720,000	720,000
Subtotal	1,319,750	231,800	1,551,550	1,672,000	166,100	338,150	2,176,250	3,727,800
Project Administration	--	--	374,100	--	--	--	148,200	522,300
GRAND TOTAL	1,319,750	231,800	1,925,650	1,672,000	166,100	338,150	2,324,450	4,250,100

1/ Price Base 1979.
2/ Actual expenditure (Structure completed).
3/ Includes costs already incurred at "Original Site" (Supplement No. 2).

June 1980

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Washington Mountain Brook Watershed, Massachusetts
(Dollars)[1/]

ITEM	COST ALLOCATION				COST SHARING										
	PURPOSE				PL-566			STATE				TOWN OF LEE			
	Flood Prevention	Recreation	Water Supply	Total	Flood Prevention	Recreation	Total	Flood Prevention	Recreation	Water Supply	Total	Flood Prevention	Recreation	Water Supply	Total
Washington Mtn. Lake	129,100	788,100	--	917,200	116,400	293,250	409,650	12,550	495,000	--	507,550	--	--	--	--
October Mtn. Lake	164,280	293,170	335,850	793,300	156,580	165,320	321,900	7,700	127,850	335,850	471,400	--	--	--	--
Schoolhouse Lake	506,100	--	457,900	964,000	493,900	--	493,900	--	--	--	--	12,200	--	457,900	470,100
Channel Work	333,300	--	--	333,300	326,100	--	326,100	--	--	--	--	7,200	--	--	7,200
Water Supply Pipeline, Intakes & Chlorinator	--	--	720,000	720,000	--	--	--	--	--	59,600	59,600	--	--	660,400	660,400
TOTAL	1,132,780	1,081,270	1,513,750	3,727,800	1,092,980	458,570	1,551,550	20,250	622,850	395,450	1,038,550	19,400	--	1,118,300	1,137,700

1/ Price Base 1979.

June 1980

TABLE 3 - PRELIMINARY STRUCTURE DATA (Revised)

for the

SCHOOLHOUSE LAKE

FLOODWATER RETARDING AND WATER SUPPLY RESERVOIR

Washington Mountain Brook Watershed, Massachusetts

ITEM	UNIT	Schoolhouse Lake (Site 4)
Class of Structure		c
Drainage Area	sq. mi.	3.27
Curve No. (1-day) (AMC II)		68
T_c	hrs.	2.4
Elevation Top of Dam	ft.	1,713
Elevation Crest Emergency Spillway	ft.	1,708
Elevation Crest Low Stage Inlet	ft.	1,694.0
Maximum Height of Dam	ft.	63
Volume of Fill	cu. yd.	155,000
Total Capacity	ac. ft.	1,304
Sediment - 100 Year Accumulation	ac. ft.	35
Beneficial Use - Recreation	ac. ft.	--
Beneficial Use - Water Supply	ac. ft.	620
Floodwater Retarding	ac. ft.	649
Surface Area		
Beneficial Use Pool	acres	39
Retarding Pool	acres	55
Principal Spillway		
Rainfall Volume (areal) (1 day)	in.	6.3
Rainfall Volume (areal) (10 day)	in.	16.0
Runoff Volume (10 day)	in.	8.2
Capacity-Single Stage (Max.)	cfs	146
Frequency Operation-Emergency Spillway	% chance	<1%
Size of Conduit	diam.-in.	30
Emergency Spillway		
Rainfall Volume (ESH) (areal)	in.	12.8
Runoff Volume (ESH)	in.	8.5
Type		Veg.
Bottom Width	ft.	30
Velocity of Flow (V_e)	ft./sec.	6.8
Slope of Exit Channel	%	4
Maximum Water Surface Elevation	ft.	1,710.0
Freeboard		
Rainfall Volume (FH) (areal)	in.	22.7
Runoff Volume (FH)	in.	17.9
Maximum Water Surface Elevation	ft.	1,712.5
Capacity Equivalents		
Sediment Volume	in.	0.2
Retarding Volume	in.	3.7

June 1980

TABLE 4 - ANNUAL COST (Watershed Plan)

Washington Mountain Brook Watershed, Massachusetts

(Dollars)[1/]

Evaluation Unit	Amortized Installation Cost 2/	Operation and Maintenance	Total
Structural Measures			
1. Washington Mountain Lake 2. October Mountain Lake 3. Schoolhouse Lake 4. Channel Work & Debris Basin 5. Water Supply Pipeline Intakes & Chlorinator	126,300	56,000	182,300
Project Administration	17,700	--	17,700
Total	144,000	56,000	200,000

1/ Price Base 1979.
2/ 100-years @ 3 1/4 percent interest.

June 1980

TABLE 5 - REMAINING AVERAGE ANNUAL FLOOD DAMAGES AND DAMAGE REDUCTION BENEFITS FROM PLANNED PROJECT[1/]

Washington Mountain Brook Watershed, Massachusetts
(Dollars)

Reach	Type	Damages						Benefits		
		Without Project			With Project					
		Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
1	Residential	460	70	530	0	0	0	460	70	530
	Road & Bridge	20,970	4,190	25,160	0	0	0	20,970	4,190	25,160
	Sediment & Debris	10,780	540	11,320	2,400	120	2,520	8,380	420	8,800
	Utility	60	10	70	0	0	0	60	10	70
	Subtotal	32,270	4,810	37,080	2,400	120	2,520	29,870	4,690	34,560
2	Residential	1,490	220	1,710	0	0	0	1,490	220	1,710
	Road & Bridge	23,460	4,690	28,150	3,740	750	4,490	19,720	3,940	23,660
	Sediment & Debris	9,150	460	9,610	2,040	100	2,140	7,110	360	7,470
	Utility	1,580[2/]	320	1,900	0	0	0	1,580	320	1,900
	Subtotal	35,680	5,690	41,370	5,780	850	6,630	29,900	4,840	34,740
	Grand Total	67,950	10,500	78,450	8,180	970	9,150	59,770	9,530	69,300

1/ Price Base 1979.
2/ Includes damage to water intake above Newton Bridge.

June 1980

TABLE 6 - COMPARISON OF REMAINING BENEFITS AND TOTAL COSTS FOR STRUCTURAL MEASURES[1/]

Washington Mountain Brook Watershed, Massachusetts

(Dollars)

Evaluation Unit	Average Annual Benefits[2/]					Average Annual Cost[4/]	Benefit Cost Ratio
	Flood Damage Reduction	Municipal Water Supply	Recreation[5/]	Secondary[3/]	Total		
Structural Measures							
1. Washington Mountain Lake 2. Schoolhouse Lake 3. October Mountain Lake 4. Channel Work 5. Water Supply Pipeline Intakes & Chlorinator	69,300	114,600	63,240	12,300	259,440	182,300	1.4:1
Project Administration						17,700	
Grand Total	69,300	114,600	63,240	12,300	259,440	200,000	1.3:1

1/ The remaining benefits (yet to be realized) exceed the total cost of the watershed plan. Clearly then, the total benefits exceed the total cost by an even greater margin.
2/ Price Base 1979.
3/ 10 percent of Direct Flood Prevention and Recreation Benefits.
4/ From Table 4.
5/ Based on 1975 estimate by U.S. Fish & Wildlife Service.

June 1980

AGREEMENT regarding LAND USE and WATER RIGHTS
in the OCTOBER MOUNTAIN STATE FOREST
as it relates to the
WASHINGTON MOUNTAIN BROOK WATERSHED PLAN

AGREEMENT entered into this 30th day of June, 1980, by and between the TOWN of LEE and the DEPARTMENT OF ENVIRONMENTAL MANAGEMENT of the COMMONWEALTH OF MASSACHUSETTS:

WHEREAS, the Water Resources Commission is about to enter into a watershed work plan agreement with the Department of Agriculture of the United States of America, and;

WHEREAS, the Town of Lee and the Department of Environmental Management are desirous of reaching certain understandings with respect to the exchange of rights to water supplies and compensation for loss of acreage of dedicated land;

THEREFORE, the parties agree as follows:

1. Neither party will enter into a project agreement to further carry out the works of improvement in the Washington Mountain Brook Watershed Plan until appropriate changes in the authorizing legislation have been made.

2. The Town of Lee shall have the exclusive use of the Schoolhouse Lake Site including a protective zone around the reservoir for water supply.

3. The Town of Lee will assign all rights to Finerty Pond and its watershed to the Department of Environmental Management.

4. If Schoolhouse Lake is not developed for water supply, all rights to Finerty Pond will revert to the Town of Lee and all rights to Schoolhouse Lake will revert to the Department of Environmental Management.

5. Enforcement of public use restrictions related to water supply will be the responsibility of the Town of Lee.

6. If the Town of Lee requires additional water for its municipal water system, the Town may utilize for its municipal water supply October Mountain Lake and compensate the Department of Environmental Management as follows:

   a. If the water supply storage is used only during the period from December through March to replenish storage in the primary reservoirs, no compensation will be made.

   b. When October Mountain Lake is used on a year round basis, the Town of Lee will replace the acreage of dedicated land lost as a result of the water supply storage by providing the Department of Environmental Management with an additional 34 acres of land or providing monetary compensation not to exceed the sum of $10,540.00.

Richard E. Kendall
Commissioner, Department of
Environmental Management
Commonwealth of Massachusetts

6/30/80
Date

John E. DeVarennes
Chairman, Board of Selectmen
Town of Lee, Massachusetts

6/23/80
Date

WATER SUPPLY AGREEMENT

between the

TOWN OF LEE, MASSACHUSETTS

and the

TOWN OF LENOX, MASSACHUSETTS

This agreement is between the Town of Lee, Massachusetts and the Town of Lenox, Massachusetts.

Both Lee and Lenox are faced with critical water supply shortages. Both Lee and Lenox recognize that a regional water supply utilizing the planned storage of the Washington Mountain Brook Watershed Project would be mutually beneficial. Therefore, both Towns agree to cooperate to develop a permanent regional supply based on the planned Washington Mountain Brook Watershed Project.

The Town of Lee agrees to supply the Town of Lenox with water from the Washington Mountain Brook Project in sufficient quantity to meet currently foreseeable needs. The methods and costs by which this water will be supplied will be mutually acceptable to both Lee and Lenox.

The Town of Lenox agrees to work closely with the Town of Lee to develop a mutually acceptable method to obtain a permanent water supply from the Washington Mountain Brook Project.

11/26/80

DAVID W. PARKER, CHAIRMAN
TOWN OF LEE
DEPARTMENT OF PUBLIC WORKS

11/25/80

GEORGE R. LAGARCE, CHAIRMAN
TOWN OF LENOX
DEPARTMENT OF PUBLIC WORKS

The Commonwealth of Massachusetts

Department of Environmental Quality Engineering

WESTERN REGION

WESTERN MASSACHUSETTS PUBLIC HEALTH CENTER
UNIVERSITY OF MASSACHUSETTS, AMHERST 01002

(413) 549-1917
(413) 545-2610
(413) 549-6442

October 21, 1980

Mr. Sherman L. Lewis
State Conservationist
Soil Conservation Service
West Street
Amherst, Massachusetts 01002

Re: Proposed Washington
Mountain Brook
Watershed Project

Dear Mr. Lewis:

In reference to the proposed multi-purpose October Mt. Lake impoundment, which is designed to be used for water supply, recreation and flood control, I would like to call to your attention the following Massachusetts regulations concerning recreation:

310 CMR 22.20(7) "Drinking Water Regulations of Massachusetts" states that: No person shall wade or bath in any source of drinking water supply, and no person shall, unless permitted by written permit by the Board of Water Commissioners, or like body having jurisdiction over such source of supply, fish in, enter or go in any boat, seaplane, or other contrivance; enter upon the ice for any purpose, including the cutting or taking of ice; or cause any animal to go in or upon such source of water supply or tributary thereto.

If you have any questions pertaining to this matter, please feel free to contact this office.

Very truly yours,
For the Commissioner,

Angelo Iantosca
Regional Environmental Engineer

AI:TMc:gl

BOARD OF HEALTH
TOWN OF LEE
MASSACHUSETTS

January 7, 1981

Mr. Sherman Lewis
State Conservationist
Soil Conservation Service
West Street
Amherst, MA 01002

Re: Proposed Washington Mountain Project

Dear Mr. Lewis;

The Lee Board of Health has been asked to outline any restrictions that would be placed on the proposed School House and October Mountain water supplie

We wish to call your attention to the following regulations:

I. Section 20 (a) - (i) Drinking Water Regulations of Massachusetts (copy enclosed)

II. Forest Harvest, Water Supply and Wetlands Laws

a. General Laws, Chapter 132, Section 40-46 Forest Practices Act
b. General Laws, Chapter 45, Section 19 & 21 Town or City Forests
c. General Laws, Chapter 48, Section 16 Placement of Slash
d. General Laws, Chapter 131, Section 40 Wetlands Protection Act
e. General Laws, Chapter 111, Section 167 & 169 Court Injunctions to Protect Public Health

(copies enclosed)

III. Title 5, Regulation 3.7 (1), (2), (5) State Environmental Code

specifies that no sewage disposal facility shall be placed within 100 fee of any surface water supplies (reservoirs) or tributaries to reservoirs, incluc open and subsurface drains. (copy enclosed)

IV. Commonwealth of Massachusetts Manual of Laws Relating to Public Health, Chapter 111, Section 167 (copy enclosed)

BOARD OF HEALTH
TOWN OF LEE
MASSACHUSETTS

We further require the posting of School House lake specifying no swimming, fishing or boating, and that October Mountain lake be posted specifying no swimming and the use of internal combustion engines in or on the lake be prohibited.

For any additional applicable state regulations concerning the protection of public water supplies, I suggest you contact the State Department of Environmental Quality Engineering in Amherst, 549-1917.

Yours truly,

Charles W. Stratton

Dr. Charles Stratton
Chairman,
Lee Board of Health

CS/pdc

cc: Lee Department of Public Works
Lee Selectmen
Tri-Town Health Dept.
Board of Selectmen, Washington, MA
Department of Environmental Quality Engineering

Encls:

'SECTION 404' PERMIT PROGRAM

U.S. ARMY, CORPS OF ENGINEERS

INTRODUCTION. For many years at the direction of Congress, the Corps of Engineers has been charged with various regulation responsibilities dealing with water resources. More recently, that responsibility has been expanded to include the "404 program" to restore and maintain water quality by regulating the discharge of dredged or fill material in all waters of the United States. (See glossary for definition of underscored terms)

AUTHORITY. The basis for the U.S. Army, Corps of Engineers' responsibility to regulate the disposal of dredged or fill material is the Federal Water Pollution Control Act Amendments of 1972. Section 404 of that Act charges the Secretary of the Army, acting through the Chief of Engineers, to regulate the discharge of dredged or fill material in the waters of the United States. Initially, the Corps of Engineers limited its regulatory authority under Section 404 to waters which are presently used, were used in the past, or could be used by reasonable improvements to transport interstate commerce.

Limiting the Corps' authority under Section 404 to navigable waters of the United States was successfully challenged in the U.S. District Court for the District of Columbia. On March 27, 1975, the Court directed the Corps of Engineers to extend its responsibility to regulate the discharge of dredged or fill material under Section 404 to all waters of the United States (including the territorial seas) and to revise its regulation accordingly. A proposed draft regulation was published in the Federal Register on May 6, 1975, for comment, and an interim final regulation was published on July 25, 1975, and became effective on that date. Final regulations were published in the Federal Register on July 19, 1977 reflecting two years experience in administering the Section 404 program and the extensive public response received. Those final regulations include the entire regulatory program of the Corps of Engineers.

PURPOSE. The purpose of this program, which is part of the Corps of Engineers' overall regulatory authority, is to insure that the chemical/biological integrity of waters of the United States is protected from the irresponsible and unregulated discharges of dredged or fill material that could permanently destroy or alter the character of these valuable resources.

ACTIVITIES INCLUDED. Along with the discharge of material which has been dredged or excavated from any waters of the United States, the following additional types of activities will also be regulated by this program: site development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands; property protection and/or reclamation devices such as riprap, groins, seawalls, breakwaters and bulkheads and fills; beach nourishment; levees; sanitary landfills, and backfill required for the placement of structures such as sewage treatment facilitites.

FARMING EXEMPT. The Section 404 permit program does not apply to normal farming practices such as plowing, cultivating, seeding, and harvesting. Nor does it apply to such farm and ranch conservation practices as terracing, land levelling, and the construction of check dams unless they occur in a water of the United States. However, damming of major streams, diking, and the discharge of dredged or fill material in wetlands associated with farm practices will require permits.

NATIONWIDE PERMITS. For the purposes of Section 404, the following discharges of dredged or fill material are permitted by the July 19, 1977 regulations without the need to submit an application, provided certain conditions are met:

Discharges of dredged or fill material into non-tidal rivers and streams including adjacent wetlands above their headwaters (where the average annual flow is less than 5 cubic feet per second).

Natural lakes, including adjacent wetlands, that are less than 10 acres in surface area.

Bedding and backfill for utility crossings, provided there is no change in preconstruction ground elevations. Other construction fills, whether temporary or permanent, such as for construction access or cofferdams will require an individual permit.

Bank stabilization fills less than 500 feet long, necessary for erosion prevention and involving less than 1 cubic yard per running foot, provided that no discharge occurs in any wetland.

Minor road crossing fills involving less than 200 cubic yards of fill placed below ordinary high water and less than 100' intrusion of fill into any wetland measured from the ordinary high water line along either bank. Crossing must be bridged or culverted to prevent restricting high flows.

Fills in tidal waters associated to with bridge construction including cofferdams, abutments, piers, and temporary construction and access fills; but not including roadway approach fills and causeways.

Repair, rehabilitation, or replacement of any previously authorized, currently serviceable fill, or of any currently serviceable fill discharged prior to the requirement for authorization; provided such repair, rehabilitation, or replacement does not result in a deviation from the specifications of the original work, and further provided that the fill to be maintained has not been put to uses differing from uses specified for it in any permit authorizing its original construction.

Water quality and coastal zone management certifications must be obtained before such discharges can occur, however. And the Division Engineer may still require an individual to submit an application for a particular discharge falling within one of these exceptions if he feels the interest of water quality requires it.

WHERE TO APPLY FOR A PERMIT. Application for a permit under this program should be made to

Chief, Regulatory Branch
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Telephone 617-894-2400, Ext. 332

The New England Division is responsible for federal water resources development and regulatory functions in the six New England States with the exception of the St. Lawrence and Hudson River Drainage areas in western Vermont and along parts of the western borders of Massachusetts and Connecticut. Those are within the North Atlantic Division.

Separate authorizations required by state and local governments must still be obtained. Applications may be submitted for Corps of Engineers' permits at the same time you submit state and local applications. In many instances this will save you considerable time.

HOW APPLICATIONS ARE PROCESSED. A public notice is issued on each permit application. Substantive comments received from interested individuals, groups, or government agencies are furnished the applicant for his rebuttal. Often a public hearing will also be held before the Division Engineer issues or denies a permit. Major controversial cases may be referred to higher headquarters for a decision.

CONSIDERATIONS. In evaluating a permit application, the Corps of Engineers will thoroughly analyze the impact of the proposed activity on the public interest including water quality. The benefits which may accrue from the proposal will be weighed against any forseeable detriments, and a permit will be issued only when its issuance is found to be in the public interest.

Contact with the Corps of Engineers should be made before disposal of any dredged or fill material. This could save considerable time and expense.

YOU CAN HELP. The understanding and support of the American people is vital to the success of this program. In order to protect the quality of our water resources, including wetlands, we must all join in this vital effort. We ask your help in "passing the word" to others concerning the permit requirements outlined in this paper.

GLOSSARY.

Waters of the United States - all waters and their adjacent wetlands including tidal waters, lakes and ponds, rivers and streams, and isolated wetlands.

Dredged material - material that is excavated or dredged from waters of the United states.

Discharge of dredged material - any addition of dredged material into waters of the United States including the runoff or overflow from a contained land or water disposal area.

Fill material - any material used for the primary purpose of replacing an aquatic area with dry land or of changing the bottom elevation of a waterbody.

Discharge of fill material - the addition of fill material into waters of the United States.

Wetlands - those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

NOTE: Copies of the complete regulations of the Corps of Engineers' permit program are found in the 19 July 1977 Federal Register available from the Superintendent of Documents, Washington, DC 20402.

APPENDIX B

ENVIRONMENTAL SURVEY

Summary - Benthic Survey

A 200 foot reach was cordoned off at each station for the fishing survey. Prior to electrofishing, benthic samples were obtained in midstream at the 50-, 100-, and 150-foot points along the sampling reach. Samples were obtained using a one square foot Surber Sampler with a net mesh of 571 u. All stones within the grid were scraped using a fine brush and putty knife, and the bottom was stirred using a hand garden fork. Normally the bottom consisted of large rocks overlain by a thin coat of gravel and larger stones. Therefore, the effective sampling depth was quite shallow, certainly no more than 3 or 4 inches. Exceptions to this procedure occurred at Station 8, where a 100-foot reach was surveyed, with samples at 0, 50, and 100 feet; and at Station 8a, where the substrate was silt. At 8a, a Peterson Grab with an area of 213 cm^2 effective to a depth of approximately 2 cm was used to obtain three samples at 50 foot intervals. These samples were sieved in the field through a #30 standard sieve (590 u aperture). Samples obtained from the Surber Sampler were transferred directly to 5 percent formalin without further sieving. Upon returning to the laboratory, all samples were sorted in shallow white enamel pans and the animals removed. Even though three samples were collected at each station, only two samples were counted. All individuals in each sample were identified using Pennak (1953), Edmondson (1959) or Usinger (1956). No attempt was made to refer to more recent monographs.

TABLE B-1 A LIST OF THE BENTHIC INVERTEBRATES IDENTIFIED FROM WASHINGTON MOUNTAIN BROOK, AUGUST, 1975.

Phylum	Class	Order	Family	Subfamily	Genus/Species (Stage)
Platyhelminthes	Turbellaria	Tricladida	Planariidae (?)		Unidentified (adult)
Annelida	Oligochaeta	Plesiopora	Enchytraeidae (?)		Unidentified (adult)
		Prosopora	Lumbriculidae (?)		Unidentified (adult)
Arthropoda	Crustacea	Amphipoda	Gammaridae		
	Arachnoidea	Hydracarina	Limnocharidae		*Limnochares sp.* (adult)
	Insecta	Collembola	Isotomidae		*Isotoma sp.* (adult)
		Plecoptera	Peltoperlidae		*Peltoperla sp.* (nymph)
			Perlidae	Perlinae	*Phasganophora capitata* (nymph)
				Acroneuriinae	*Acroneuria sp.* (nymph)
			Perlodidae	Isogeninae	*Isogenus sp.* (nymph)
		Ephemeroptera	Baetidae		*Ephemerella sp.* (nymph)
					Baetis sp. (nymph)
					Paraleptophebia sp. (nymph)
					Centroptilum sp. (nymph)
					Pseudocloeon sp. (nymph)
					Ameletus (?) sp. (nymph)
					Unidentified (nymph)
			Heptageniidae		*Stenonema sp.* (nymph)
		Trichoptera	Rhyacophilidae		*Rhyacophila sp.*(larvae)
					Unidentified (larvae)
			Philopotamidae		*Chimarra sp.* (larvae)
			Hydropsychidae		*Hydropsyche sp.* (larvae)
					Cheumatopsyche sp. (larvae)
					Diplectrona sp. (larvae)
			Limnephilidae		*Neophylax sp.* (larvae)
			Odontoceridae		*Psilotreta sp.* (larvae and pupae)
			Leptoceridae		*Leptocella sp.* (larvae)
			Brachycentridae		*Micrasema (?) sp.* (larvae)
			Glossosomatidae		*Glossosoma sp.* (larvae and pupae)
			Helicopsychidae		*Helicopsyche sp.* (larvae)
		Coleoptera	Psephenidae		*Ectopria sp.* (larvae)
			Elmidae		*Simsonia sp.* (larvae and pupae)
					Unidentified Elmid (adult)
					Elmid #1 (larvae)
					Elmid #2 (larvae)
		Lepidoptera			Unidentified (larvae)
		Diptera	Tipulidae		*Tipula sp.* (larvae)
					Hexatoma sp. (larvae)
					Antocha sp. (larvae)
			Rhagionidae		*Atherix (variegata?)* (larvae)
			Ceratopogonidae		Ceratopogonid #1 (larvae)
			Simuliidae		Unidentified (larvae and pupae)
			Chironomidae	Pelopiinae	Unidentified (larvae)
				Tendipedinae	*Pseudochironomus (?) sp.* (larvae)
					Microtendipes (?) sp. (larvae)

TABLE B-1 A LIST OF THE BENTHIC INVERTEBRATES IDENTIFIED FROM WASHINGTON MOUNTAIN BROOK, AUGUST, 1975. (CONTINUED)

Phylum	Class	Order	Family	Subfamily	Genus/Species (Stage)
					Calopsectra (?) sp. (larvae)
				Hydrobaeninae	*Corynoneura (?) sp.* (larvae)
					Cardiocladuis (?) sp. (larvae)
					Hydrobaenus (?) sp. (larvae)
				Diamesinae	*Syndiamesa (?) sp.* (larvae)
				Unknown	Midge #1 (larvae)
					Midge #2 (larvae)
					Midge #3 (larvae)
			Unknown		Unidentified (pupae, probably Tendipedidae)
Mollusca	Pelecypoda	Heterodonta	Sphaeriidae		Unidentified

TABLE B-2 THE RESULTS OF THE AUGUST BENTHIC FAUNA SURVEY FOR WASHINGTON MOUNTAIN BROOK. SAMPLES WERE COLLECTED USING A SERBER SAMPLER (ONE SQUARE FOOT). RESULTS ARE GIVEN IN NUMBERS OF INDIVIDUALS PER SAMPLE (ONE SQUARE FOOT).

SPECIES	1		1A		2		3		5		8		8A		Total
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
Unidentified Turbellarian (a)	-	-	1	-	-	1	-	3	-	-	-	-	-	-	5
F. Enchytraeidae (a)	1	5	1	-	4	1	-	-	-	-	10	4	-	-	26
F. Lumbriculidae (a)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
F. Gammaridae (a)	-	-	-	-	-	-	-	-	-	4	-	-	-	-	4
Limnochares sp. (a)	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Isotoma sp. (a)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Peltoperla sp. (n)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Phasganophora capitata (n)	3	1	2	1	-	-	-	-	1	-	-	-	-	-	8
Acroneuria sp. (n)	3	-	1	2	3	2	-	-	-	-	-	-	-	-	11
Isogenus sp. (n)	3	-	9	17	8	3	-	3	-	-	-	-	-	-	43
Ephemerella sp. (n)	-	-	1	-	5	3	-	-	13	14	-	-	-	-	36
Baetis sp. (n)	2	-	-	12	-	-	-	-	-	-	-	-	-	-	14
Paraleptophlebia sp. (n)	-	-	9	4	-	1	-	-	1	-	-	-	-	-	15
Centroptilum sp. (n)	16	11	-	1	21	12	1	-	-	-	-	-	-	-	62
Pseudocloeon sp. (n)	40	5	1	8	-	2	-	1	-	-	-	-	-	-	57
Arclatus (?) sp. (n)	-	-	20	-	-	-	-	-	-	-	-	-	-	-	20
Unidentified Mayfly (n)	4	-	-	4	-	-	-	2	-	-	-	-	-	-	10
Stenonema sp. (n)	-	8	1	15	14	-	10	1	15	4	-	-	-	-	68
Rhyacophila sp. (1)	2	-	-	4	1	7	-	1	-	3	4	-	-	-	22
Unidentified Rhyacophilidae (1)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Chimarra sp. (1)	5	1	1	11	-	-	-	-	-	4	49	15	-	-	86
Hydropsyche sp. (1)	25	7	4	21	4	8	2	1	2	40	77	13	-	-	204
Diplectrona sp. (1)	-	-	-	-	-	-	-	1	-	31	-	1	-	-	33
Chewmatopsyche sp. (1)	1	-	-	-	-	-	-	-	-	1	2	-	-	-	4
Neophylax sp. (1)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Psilotreta sp. (1)	-	-	-	-	1	1	-	-	1	-	-	-	-	-	3
Psilotreta sp. (p)	-	-	-	-	-	-	-	-	-	-	3	-	-	-	3
Leptocella sp. (1)	2	1	-	5	-	1	-	-	-	-	-	-	-	-	9
Micrasema (?) sp. (1)	11	-	-	-	6	21	-	-	18	8	-	-	-	-	64
Glossosoma sp. (1)	-	-	1	-	1	-	4	2	-	-	-	-	-	-	8
Glossosoma sp. (p)	-	-	4	2	2	-	4	4	-	-	10	-	-	-	26
Helicopsyche sp. (1)	-	2	-	-	1	-	-	-	-	-	-	-	-	-	3
Ectopria sp. (1)	-	-	1	3	-	-	-	-	1	3	-	-	-	-	8
Simsonia sp. (1)	-	-	-	-	178	225	1	2	36	54	-	-	-	-	496
Simsonia (p)	-	-	-	-	3	-	-	-	-	-	-	-	-	-	3
Adult Elmid (a)	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Elmid #1 (1)	-	-	-	-	-	-	-	-	2	1	-	-	-	-	3
Elmid #2 (1)	-	-	1	-	-	-	5	-	-	-	-	-	-	-	6
Lepidoptera (1)	-	-	-	-	-	-	-	-	-	1	1	-	-	-	2
Tipula sp. (1)	-	-	-	-	3	2	-	-	1	2	2	-	-	-	10
F. Simulidae (1)	-	-	-	1	-	-	1	2	-	1	136	61	-	-	202
F. Simulidae (1)	-	-	-	-	-	-	-	-	-	-	11	12	-	-	23
Hexatoma sp. (1)	-	-	1	7	-	-	-	-	-	-	-	1	-	-	9
Antocha sp. (1)	3	6	-	-	-	-	-	-	-	-	-	-	-	-	9
Atherix (variegata?) (1)	1	1	2	1	4	5	2	1	-	-	-	-	-	-	17

TABLE B-2 Continued. THE RESULTS OF THE AUGUST BENTHIC FAUNA SURVEY FOR WASHINGTON MOUNTAIN BROOK. SAMPLES WERE COLLECTED USING A SERBER SAMPLER (ONE SQUARE FOOT). RESULTS ARE GIVEN IN NUMBERS OF INDIVIDUALS PER SAMPLE (ONE SQUAPE FOOT).

SPECIES	1		1A		2		3		5		8		8A		Total
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
Ceratopogonid #1 (1)	-	-	-	-	1	-	-	-	-	-	4	-	-	-	5
Ceratopogonid #2 (1)	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
F. Pelopiinae (1)	3	-	5	1	7	5	-	-	3	6	32	5	-	-	67
Pseudochironomus sp. (1)	-	-	-	-	-	-	-	-	-	-	-	20	-	-	20
Microtendipes sp. (1)	1	1	21	10	7	3		25		2	27	-	-	-	97
Calopsectra sp. (1)	-	-	17	-	-	-	2	-	-	-	29	-	-	-	48
Corynoneura sp. (1)	-	-	-	-	4	1	-	-	-	3	1	-	-	-	9
Cardiocladius sp. (1)	198	152	12	16	18	39	3	-	-	9	-	-	-	-	447
Hydrobaenus sp. (1)	73	21	35	55	13				24	36	5	3	-	-	265
Syndiamesa sp. (1)	4	-	-	-	45	205	1	-	-	-	-	-	-	-	255
Midge #1 (1)	-	-	-	-	-	-	-	-	-	2	2	-	-	-	4
Midge #2 (1)	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2
Midge #3 (1)	24	1	5	2	-	3	-	-	-	-	-	-	-	-	35
Unidentified Tendipedidae (p)	1	-	-	1	-	-	-	2	-	1	-	-	-	-	5
Unidentified Dipteran (p)	8	5	-	12	1	5	-	-	-	3	7	1	-	-	42
Sphaeriidean clam	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2
TOTAL	434	228	156	217	357	557	36	49	118	236	417	138	-	-	2,943

a = adult
n = nymph
l = larvae
p = pupae

TABLE B-3

THE RELATIVE ABUNDANCE (AS PERCENTAGE)
OF THE MAJOR GROUPS OF BENTHIC INVERTEBRATES
COLLECTED AT EACH STATION ON WASHINGTON MOUNTAIN BROOK, AUGUST 1975

	1		1A		2		3		5		8	
	A	B	A	B	A	B	A	B	A	B	A	B
Turbellaria	0	0	0.6	0	0	0.2	0	0	0	1.3	0	0
Oligochaeta	.2	2.2	0.6	0	1.1	0.2	0	0	0	0	2.6	2.9
Amphipoda	0	0	0	0	0	0	0	0	0	1.7	0	0
Hydracarina	0	0	0	0	0.3	0	0	0	0	0	0	0
Collembola	0	0	0	0	0	0	0	0	0	0	0	0.7
Plecoptera	2.0	0.4	7.7	9.1	3.1	1.1	0	6.1	0.8	0	0	0
Ephemeroptera	14.3	10.5	20.6	20.3	11.2	3.2	30.2	8.2	24.4	7.6	0	0
Tricoptera	10.6	4.8	6.4	20.3	4.5	6.8	27.8	18.4	17.6	36.9	34.8	21.8
Coleoptera	0	0	1.3	1.4	50.2	40.4	16.7	4.1	32.8	24.6	0	0
Lepidoptera	0	0	0	0	0	0	0	0	0	0.4	0	0.7
Tipulidae	0.7	2.6	0.6	3.2	0.8	0.4	0	0	0.8	0.8	0.5	0
Simuliidae	0	0	0	0.5	0	0	2.8	4.1	0.8	0.4	35.3	52.9
Rhagionidae	0.2	0.4	1.3	0.5	1.1	0.9	5.7	2.0	0	0	0	0
Ceratopogonidae	0	0	0	0	0.3	0	0	2.0	0	0	1.0	0
Tendipedidae	72.0	78.1	60.9	44.7	27.5	46.9	16.8	55.1	22.8	26.3	25.3	21.0
Sphaeriidae	0	0	0	0	0	0	0	0	0	0	0.5	0

TABLE B-4

SURFACE WATER QUALITY OF FINERTY POND
ON AUGUST 7 AND AUGUST 21, 1975

Parameter	August 7	August 21
Time of Day	1020	0815
Water Temperature (°C)	20.5	21.1
Dissolved Oxygen (mg/l)	6.5	7.6
BOD (mg/l)	1	1
COD (mg/l)	2	20
Total Dissolved Solids (mg/l)	22	20
Total Suspended Solids (mg/l)	14	12
Turbidity (JTU)	6.0	2.5
Color (units)	30	20
pH	5.2	5.2
Nitrate Nitrogen (mgN/l)	0.00	0.45
Ammonia Nitrogen (mgN/l)	0.00	0.27
Total Nitrogen (mgN/l)	15.12	1.56
Orthophosphate (mgP/l)	0.00	0.16
Total Phosphorus (mgP/l)	0.08	0.16
Fecal Coliforms (MF/100ml)	0	0
Total Coliforms (MF/100ml)	50	0

WILDLIFE CLASSIFICATION STATUS

Pursuant to the Endangered Species Act of 1973 there were no threatened or endangered species found in the watershed. In 1975[1] the Massachusetts Division of Fisheries and Wildlife developed an inventory of Massachusetts fish and wildlife resources. No species identified as threatened or endangered on this state list was found in the watershed.

Two species were inventoried in the watershed which are believed to be decreasing in abundance in Massachusetts.[1] These species are the: red shouldered hawk which is classified[1] as having a statewide distribution but is uncommon in relative abundance; and the eastern bluebird which has a statewide distribution and an uncommon to rare relative abundance. The possible reason for the population decline of the red shouldered hawk is indicated as pesticides.[1] The possible reasons for the population decline of the eastern bluebird are habitat decline, pesticides and competition for nesting sites.

A study of red shouldered hawk nesting habits in the Quabbin Reservation (Portnoy, 1974) determined that they have an average hunting territory of approximately 220 acres; nest in mature hardwoods, primarily black or yellow birch and nest sites are located on east or northeast slopes near open wetland. This study indicates that an apparent population decline of red shouldered hawks in the northeast may be due to habitat specificity and a sensitivity to human disturbance during this nesting period.

An inventory of the beaver flowages in the watershed determined that there are presently two active flowages and 21 inactive flowages two of which have had very recent beaver activity as fresh beaver cuttings were found. Whether active or inactive the flowages all provide some open wetland consisting primarily of fresh meadow and shallow marsh. With the planned project there would be one active flowage and 17 inactive flowages including the two where fresh cuttings were noted.

At the present time there are an estimated 13 potential red shouldered hawk nesting sites in the watershed. With the planned project installed there would be an estimated 10 nesting sites. These sites would all consist of east or northeast facing slopes, are present within 90 feet elevation change of an open wetland, occur in close proximity to open wetlands, occur where preferred nesting trees are present, and are not adjoining a high use area by man.

1/ An Inventory of Massachusetts Fish and Wildlife (Vertebrate) Resources by Paul S. Mugford, Massachusetts Division of Fisheries and Wildlife, Boston, Massachusetts, 1975.

The typical habitat[1/] of the eastern bluebird is open woods, swamps, rural roadsides, farmland and burned-over areas. In the Washington Mountain Brook Watershed there are idle fields near the lower elevation urbanized area, two small open fields in the state forest, an open area around the Washington Mountain Lake dam, dike, disposal area and emergency spillway, 2 active beaver flowages and 21 inactive beaver flowages (totalling approximately 114 acres), and several miles of underground cable and transmission line which provide a limited quantity of bluebird habitat. Completion of the planned project would result in reducing the existing open areas by approximately 21 acres which consists of 1 active and 4 inactive beaver flowages. Completion of the project would, however, create 29 acres of grassland as a result of seeding portions of the dam, the emergency spillway and disposal areas. With the project completed there would, therefore, be a net gain of 8 acres of open area which would be expected to benefit eastern bluebird if their other habitat requirements are also available.

1/ An Inventory of Massachusetts Fish and Wildlife (Vertebrate) Resources by Paul S. Mugford, Massachusetts Division of Fisheries and Wildlife, Boston, Massachusetts, 1975.

HISTORICAL AND ARCHAEOLOGICAL SURVEY

Condensed from a report prepared by
Mr. John Pretola, Professional Archaeologist

INTRODUCTION

Objectives

The objectives of this archaeological survey were three fold: (1) to locate both prehistoric and historic sites of archaeological significance in the Washington Mountain Brook Watershed; (2) to determine whether any of the sites were affected by the construction of the planned impoundments; (3) to test excavate any possible endangered sites as a preliminary to recommending such sites for salvage excavation.

Survey Methods

The techniques and methods utilized in the survey were systematic and involved the inspection of historical documentation showing the possible locations of historic sites in the study area. In addition, the office of the state archaeologist was consulted concerning possible prehistoric sites. Nearly a dozen local persons, historians, rangers, foresters and amateur archaeologists were interviewed concerning possible sites. These leads were followed up by surface inspection of likely looking places. The surface inspection proved to be the most difficult aspect of the survey.

Many of the sites occurred in spruce plantations or in areas of heavy brush. This cover made it difficult to locate surface artifacts. Historical documentation was also difficult to obtain. Assessor' maps do not exist, but two county maps from the 19th century have survived (Smith & Gallus, 1858; White & Co., 1876).

Each site discovered was assigned a number on the basis of order of discovery. The survey was done by permission of Maurice Robbins, the State Archaeologist for the Commonwealth of Massachusetts under Permit No. 37.

HISTORICAL AND ARCHAEOLOGICAL SETTING

History

The Washington Mountain Brook Watershed is part of the Watsontown grant purchased from the Stockbridge Indians some time near 1760. The grant consisted of parts of modern-day Lee, Lenox and Becket townships, as well as, almost all of Washington, Massachusetts. Watsontown was repurchased in 1760 by a group from Hartford, Connecticut and renamed Greenock. In 1763, the Massachusetts General Court awarded them a charter calling the area Hartwood and instructing the proprietors to lay out and clear 60 house lots and build a church and school. The area flourished, and in 1777 the townships of Lee and Washington were incorporated out of Hartwood (Beers Co., 1885: 144-45; Gale, 1854: 4-10).

The first United States Census of 1791 shows a population of 588 for the late 18th century town of Washington. Most of the settlers were of English extraction from eastern and central Massachusetts as well as parts of Connecticut and Rhode Island.

Early in the 19th century, most of the farmers moved into the Ohio or Saint Lawrence valleys. Title to their land in Washington reverted to family members still living in Hartford, Connecticut. These lands were rented out or sold. Most of the farmland was used for grazing cattle and sheep. Cash crops of corn, wheat, oats and rye were also grown.

When the Pontoosuc Turnpike was built in 1830 (connecting Chester with Pittsfield), Washington Center served as a way station for stage travel on that road. This lasted until 1837 and it was during this period that the town reached a population of nearly 1,000 people. The advent of the railroad in 1841 spelled doom for the farmers of Berkshire County. It made cheaper western beef more available and ruined the market for local beef. More and more, the local farmers had to supplement farming by working in the mills which proliferated on the many small streams in the area. Sawmills were common, but there were also turning mills for making furniture parts in Lee, and the spruce shingle industry was large in this area also. The hills were logged to make charcoal as well.

The four corners area population increased only slightly judging by the number of houses added to the map. It appears this area was more of a back woods hamlet. By 1900 there were only 377 residents in the entire town of Washington. Most of them resided in Washington Center or Washington Post Office. There must have been only a few people still living in the four corners area when William C. Whitney, a millionaire and past Secretary of the Navy, decided to buy the land in 1896. Although Whitney's development of the area is the subject of many local legends, little specific information can be found concerning his activities in the watershed. The four corners area was part of Whitney's hunting preserve where according to tradition he erected a hunting lodge. He also built a caretaker's house and a wooden fire or water tower nearby.

After his wife's death Whitney abandoned the area and the Commonwealth of Massachusetts made his estate part of the 14,000 acre October Mountain Forest early in the 20th century.

Today the entire area around the four corners and down Washington Mountain Brook Road gives mute testimony to human activity in this area. Apple trees, growing from sproutings, occur in several places--suggesting the one time location of ancient orchards. Segments of stone fences run through the forest--indicating once active boundary lines. Here and there are cellar holes, some partially filled in by the Civilian Conservation Corps. Modern evidence of recreational use is indicated by a number of recent fire hearths scattered about, small trash dumps, and piles of unrusted beer cans.

FIELD OBSERVATIONS

Prehistoric Survey

Examination of prehistoric Indian artifacts in local collections and at the Berkshire Museum and Stockbridge Library did not indicate any sites in the watershed. No one could recall any material being found there as well. Most material comes either from the shores of several larger ponds in the area or the flood plain of the Housatonic River. The regional assemblage closely parallels what is to be found in the Connecticut River to the east, and the Hudson River to the west.

Archaic Period material consists of both Laurentian and Small Stemmed Quartz Point Traditions. The Brewerton Complex of the Laurentian Tradition is especially evident in private collections from sites around Goose and Greenwater Ponds and along the Housatonic River. Transitional and Woodland Period material occurs in lesser amounts in collections from along the Housatonic River. Historically the area was controlled by the Stockbridge Indians of the Mohican Indian group. Many legends have grown up surrounding them in the Housatonic Valley, and it is certain that the Washington Mountain Brook Watershed was under their control.

After talking with local amateurs, foresters and rangers who have worked or hunted in the watershed for years, I am convinced that there are no significant prehistoric Indian sites.1/ Surface walks also failed to produce a single Indian artifact. The land was probably a hunting territory, visited seasonally for a very short period of time. Such a situation would produce only thin and widely scattered occupation levels at best which the forest covering could conceal from the most careful survey.

Historical Survey

County maps of 1858 and 1876 show evidence of a village in the watershed. This is reinforced by the presence of a cemetery dating back to the mid-19th century. Figure 1 shows the locations of historic sites found during the course of the survey. Most of them consisted of cellar holes--some partially filled in by the Civilian Conservation Corps. In some cases, barn cellar holes exist near the houses.

1/ At the request of the staff archaeologist for the State Historic Preservation Officer, additional studies including excavation at 100 feet transects in certain areas to be disturbed by project installation are being undertaken to verify this conclusion.

Findings

The Washington Mountain Brook Watershed is unique in that it preserves the remains of a mid-19th century agricultural village.[1/] The survey shows that for the most part, the village remains are intact and have not been influenced by later activities as is so often true in more populous areas. The area can be studied as a region and not as a few scattered surviving cellar holes. A total of 19 sites were located within the watershed.

Two sites (WMB-7 and WMB-13) are probably endangered by the impoundment project and should be subjected to salvage archaeology.[2/] While the WMB-7 site was not tested and surface finds were few, the fact that it is easily accessible and shows no sign of looting presents a strong case for excavation. Certainly, its vulnerability to erosion during construction makes it imperative that excavation be attempted before work on the October Mountain Lake begins.

The WMB-13 site shows evidence of being a rich site as far as archaeological materials are concerned. Its location near to the shore of Washington Mountain Lake could result in its being lost to archaeological inquiry due to a resulting rise in the water table. Increased public use of the area could result in even further looting at the site as well.

The 17 other sites in the watershed show great potential for further study, but are not recommended for salvage because the projects do not endanger them as long as certain safeguards such as, prevention of further looting are provided for.

These sites lend themselves to several research topics within historical archaeology. Besides answering questions concerning life ways, this area can give us insights into settlement patterns. Where did these people locate themselves on the land and why? We know that these people were farmers who were articulated with the nation's industrial economy. Further study could show us more specifically in what way this was true. In general, the watershed's archaeological potential is great.

1/ At the request of the staff archeologist, for the State Historic Preservation Officer, additional studies were undertaken to determine if the agricultural village is eligible for nomination to the National Register of Historic Places as a Historic District.

2/ Additional observations in the field by John Pretola, Archaeologist, Frank McManamon, Staff Archaeologist SHPO, and SCS personnel have revealed that sites WMB-7 and WMB-13 will not be directly affected by installation of the Washington Mountain Brook Project. Care will be taken to protect these sites during construction.

Land Use and the Archaeological Resources

As part of the October Mountain State Forest, the Washington Mountain Brook Watershed receives heavy use by hikers, picnickers, joggers, hunters, and others. This heavy recreational usage is reflected in the condition of several of the historical sites in the watershed. Some sites show evidence of looting and the cemetery has been horribly vandalized. The addition of the proposed impoundments will bring even more attention to the area and make a few sites more vulnerable to looting unless certain safeguards are undertaken.

LEAGUE OF WOMEN VOTERS OF CENTRAL BERKSHIRE

151 New Lenox Rd.
Lenox, Ma. 0124

Joan R. Flood
President

413-637-0198

Polychlorinated Biphenals (PCBs) in the Housatonic River Watershed

PCB contamination of the Housatonic River is a known and proven fact. PCB contamination in 1979, two years after outright ban of PCBs at the General Electric Co., shows no significant decline. The reason for this as noted in a report by Angelo Iantosca are "continuing sources of input from tertiary streams, old and current waste disposal sites, industrial sources, air pollution, etc. But the significant factor appears to be the PCB in the sediment." He also states: "The two most serious public health problems associated with river contamination are the ingestion of contaminated fish and the potential contamination of adjacent groundwater aquifers through river infiltration."

A subsequent study dated July 1, 1980, by Charles R. Frink[1] concludes "it appears that the principal source of PCBs in the sediment of the Housatonic River in Connecticut is the sediment in Woods Pond in Massachusetts."

Following an earlier pumping test evaluation done March 26 - April 1979 by Walter Schwarz[2] which raised questions, further pumping tests were done Aug. 8 - 18, 1979. The report states "it strongly suggests that the major portion of the aquifer recharge is from storage or upgradient infiltration." No PCB tests were done in conjunction with this study. A report done by Frederick B. Gay, May 22, 1980[3], states "There is concern that these bottom materials may be a source of PCB to ground water. Although PCB is strongly sorbed to organic matter in sediments on the bottom, changing mechanical and chemical conditions may release them to solution and, as such, may be free to move into ground water

reservoirs. In the Housatonic River, natural ground water flow is from the ground to the stream. Withdrawal of ground water can, however, reverse the gradient and induce water to flow from the river through the bottom materials and may carry PCB into the aquifer and, hence, into a pumping well."

Earlier in a report dated March 28, 1978, Angelo Iantosca[4] stated "this does not preclude the possibility of movement with the leachate plume from a landfill or dump since the chemical properties of a strong leachate may facilitate a movement and dissolution of PCBs that ground water alone may no.

Furthermore there is ample evidence that PCBs, because of their persistence in the environment and difficulty of being broken down, may linger in the river for fifty years[5].

Therefore, the Department of Environmental Quality Engineering of the Commonwealth of Massachusetts[6] notified the Department of Public Works of both Lee, Mass. and Lenox, Mass. that "it is the opinion of this Department that the possibility exists of contamination by PCB and other chemicals to the ground water sources located near the Housatonic River. Therefore, we suggest that plans for development of these ground water sources be put aside, and strongly urge that you proceed with the Washington Mountain Brook Project."

New studies being done for Connecticut by the United States Fish and Wildlife Service[7] have revealed that PCDF (polychlorinated dibenzofuran) and PCDD (polychlorinated dibenzodioxin) have been found in fish taken from the Housatonic River. These chemicals are much more toxic than PCBs. PCDF is a contaminant of PCB and can be formed when PCBs are burned at temperatures too low to destroy them. PCDD can be formed when certain phenol compounds are manufactured or burned. PCDF is the most hazardous of the three compounds.

<u>What do we know about PCBs, PCDF and PCDD and health effects</u>?

Since the first report of PCB related Chloracne in 1936, the toxicity of PCBs has been recognized. That incident was thought to be caused by unidentifi

impurities in a single batch of early PCB.

The most dramatic occurrence of human PCB poisoning was the socalled "YUSHO" incident in Japan in 1968 when a supply of cooking oil was contaminated with a very high concentration of PCB (2000-3000 parts per million) (ppm). Victims were permanently affected with serious skin, nervous and lung disorders. It is now believed the offending element was PCDF and polychlorinated quaterphenols(8).

Workers exposed to PCBs, PCDD and PCDF have developed chloracne, liver, skin, digestive and lung disorders. Many studies have been done and are being done on animals. Most researchers report difficulty in pinpointing specific effects which can be confidently stated as likely to occur in man. Some researchers believe that research methods are probably inadequate to apply to real world situations. All agree that there are still many unanswered questions(9).

The state of Connecticut, in 1976, issued a warning against consuming all species of fish taken from the Housatonic River from Lake Zoar north to the Massachusetts border.

Because of expressed concerns by commercial interests as well as sportsmen's groups, the state appropriated $200,000 for a controlled study.

The study is examining the biochemical effects of PCBs on persons who have received non-occupational exposure -- ingesting fish and a control group. It is hoped that information will be developed to permit the Department of Health to estimate the proper health risk.

What are PCBs?

PCBs are part of a broad family of organic chemicals known as chlorinated hydrocarbons. They closely resemble DDT. PCBs are even more persistent in the environment than DDT.

PCBs are essentially unalterable by any naturally occuring biological, chemical or physical process. The only known way to destroy them is by incineration

at a temperature of 2700° F. This stability allows PCBs to bioaccumulate and, therefore, the problem of fish contamination is acute. The United States Environmental Protection Agency (USEPA) has established 5 parts per million (ppm) as the upper limit for fish to be eaten. Canada has a standard of 2 ppm which USEPA is now proposing.

PCBs have been found in turkeys and chickens which ate contaminated feed. And PCBs have been found in mothers' milk. No one knows what effect PCBs may have as an additive or synergist with other contaminants widely present in mothers' milk, such as aldrin, dieldrin or hexachlorobenzene.

Douglas Costle of USEPA stated "PCBs have also been associated with birth defects, cancer and immunological effects in laboratory animals and genetic effects in microorganisms." Of the roughly 1.25 billion pounds of PCBs purchased by U.S. industries since 1929, it is estimated that 750 million pounds are still in service, 6 million pounds have been destroyed and the remaining 440 million pounds are dispersed throughout the environment.

PCBs were used mainly in power transformers and power capacitors but can be found in home air conditioners, microwave ovens, fluorescent lights and some television sets. PCBs also have been found in plasticizers, paints, adhesives, caulking compounds, carbonless papers, hydraulic and heat transfer fluids[10].

PCBs have been banned completely except in specially approved closed systems. The 1976 Toxic Substance Control Act and subsequent Rule makings in 1977-1978 established July 2, 1979, as the effective date for control.

In the Housatonic River in Massachusetts and Connecticut it is estimated that there is a total of 42,000 pounds of PCB. About 70% of this is in Massachusetts nearly all of it in Woods Pond[11].

Submitted by

Joan R. Flood
February 3, 1981

Notes

1. PCBs in Housatonic River Sediments: A Progress Report
   Charles R. Frink
   The Connecticut Agricultural Experiment Station
   New Haven, Conn. July 1, 1980

2. Status of Report of Polychlorinated Biphenol (PCB) Contamination in Western Massachusetts
   August 14, 1979
   Walter Schwarz, Principal Civil Engineer
   Department of Environmental Quality Engineering
   Commonwealth of Massachusetts

3. Occurrence and Transport of Polychlorinated Biphenols (PCB) Residue in the Housatonic River and Ground Water Adjacent to Housatonic River, Massachusetts
   Frederick B. Gay
   U.S. Geological Survey
   Water Resources Division
   150 Caseway Street
   Boston, Mass. 02114
   May 22, 1980

4. Status Report on Polychlorinated Biphenols (PCB) Levels in Western Massachusetts
   March 28, 1978
   Angelo Iantosca
   Regional Environmental Engineer
   DEQE, Commonwealth of Mass.
   Walter Schwarz
   Junior Civil Engineer

5. PCBs and the Housatonic River
   The Problem
   State of Connecticut June 1979

6. Letter to Mr. George Lagarce, Chairman
   Department of Public Works
   Lenox, Mass. 01240 December 29, 1980

7. From Angelo Iantosca
   Regional Environmental Engineer
   Department of Environmental Quality Engineering
   Commonwealth of Mass.

   cc to Lee Department of Public Works

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   from Malignant Neglect by Environmental Defense Fund and Robert H. Boyle
   Copyright 1979. Reprinted by permission of Alfred A. Knopf, Inc.

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11. Environment News E.P.A.
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General

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The Commonwealth of Massachusetts
Department of Environmental Quality Engineering
WESTERN REGION
WESTERN MASSACHUSETTS PUBLIC HEALTH CENTER
UNIVERSITY OF MASSACHUSETTS, AMHERST 01002
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COPY

December 29, 1980

Mr. George LaGarce
Chairman
Department of Public Works
Lenox, Massachusetts 01240

Re: Lenox - Lee -
Public Water Supply;
Washington Mountain
Brook Project

Dear Mr. LaGarce:

In response to your letter of November 17, 1980, to the Deputy Commissioner of the Department of Environmental Quality Engineering Mr. Thomas F. McLoughlin, it is the opinion of this Department that the possibility exists of contamination by PCB and other chemicals to the groundwater sources located near the Housatonic River. Therefore, we suggest that plans for development of these groundwater sources be put aside, and strongly urge that you proceed with the Washington Mountain Brook project.

This Department set forth conditions on the development of the Washington Mountain Brook Watershed Project in a letter to the Board of Water Commissioners of the Town of Lee in a letter dated April 21, 1967, and approved plans for construction of the October Mountain Lake site in a letter dated November 9, 1972, to the Water Resources Commission. Before and since these actions, the Towns of Lee and Lenox have experienced water supply shortages. Further delay of this project will only serve to worsen what has already become a critical water supply situation.

The treatment processes necessary for this project will depend on further evaluation of the nature and quality of the water but shall include at least filtration and disinfection. Disinfection is required of all surface water supplies, and water quality data taken from the Draft Environmental Impact Statement would indicate the need for filtration due to excessive turbidity and color.

If you have any questions on this matter, please call this office.

Very truly yours,
For the Commissioner,

Angelo Iantosca
Regional Environmental Engineer

AI:PR:gl
cc: Lee Department of Public Works
cc: Mr. Peter Kolodziej
cc: Ms. Sally Bell
1150000 - 501
1152000 - 501

BERKSHIRE ENVIRO-LABS, INC.

ROUTE 102, LEE, MASS. 01238 (413) 243-2600

USDA - Soil Conservation Service
451 West Street
Amherst, MA 01002

c/o Stephen Claughton

L-497

SAMPLE NUMBER	3992	3993
DATE COLLECTED	11/17/80	11/17/80
TIME COLLECTED	10:10am	10:30am
COLLECTED BY	Benjamin	Benjamin
DATE ANALYZED	11/17/80	11/17/80
ANALYZED BY	W.Enser	W.Enser
ANALYSIS	UNITS	
Bacteriological		
Total Coliform (MF)	/100ml	10	10
Fecal Coliform (MF)	/100ml	< 2	< 2
Physical-Chemical		
pH	SU	7.3	6.5
Color	Pt. Units	7	9
Turbidity	FTU	0.85	0.81
Suspended Solids	mg/l	0.5	0.5
Total Solids	mg/l	6.0	8.0
Orthophosphate	mg/l	0.00	0.00
Total Phosphorus	mg/l	0.03	0.01

REMARKS: Sample #3992: Finerty Pond, Surface
#3993: Finerty Pond, Outlet

< = less than

Form

William S. Enser, Jr.
Director

BERKSHIRE ENVIRO-LABS, INC.

ROUTE 102, LEE, MASS. 01238 (413) 243-2600

USDA - Soil Conservation Service
451 West Street
Amherst, MA 01002

c/o Stephen Claughton

L-497

E NUMBER		3992	3993			
COLLECTED		11/17/80	11/17/80			
COLLECTED		10:10am	10:30am			
CTED BY		Benjamin	Benjamin			
NALYZED		11/17/80	11/17/80			
ED BY		W.Enser	W.Enser			

ANALYSIS	UNITS					
sical-Chemical (Cond't)						
Ammonia	mg/l	0.03	0.08			
Nitrate/Nitrite	mg/l	0.08	0.06			
Total Kjeldahl	mg/l	0.59	0.48			
* Air Temperature	^{o}C	2	3			
* Water Temperature	^{o}C	1	2			

S: Sample #3992: Finerty Pond, Surface
#3993: Finerty Pond, Outlet

Form #L-2

* Air and Water Temperatures are field measurements made by P. Benjamin, SCS Pittsfield.

William L. Enser, Jr.
Director

The Commonwealth of Massachusetts

Department of Environmental Quality Engineering

Special Analysis

Lee

Collector: _____

urce A Sweitzer, Well #3 near Woods Pond

urce B " " #4 " " "

urce C

urce D

urce E

urce F

	A	B	C	D	E	
ample No.	541867	868				
te of Collection	3/9/77					
te of Recoipt	3/21/77					
PCB	0.5	0.9				

EMARKS

Reported in part per million as Aroclor 1260

The Commonwealth of Massachusetts

Department of Environmental Quality Engineering

Special Analysis

Lee

Collector: _____

ce A Schwietzer Well #2

ce B " " #3

ce C " " #4

ce D

ce E

ce F

	A	B	C	D	E	F
ple No.	543451	452	453			
e of Collection	8/26/77					
e of Receipt	8/30/77					
as 1254	4.8	2.0	2.7			

KBI

Parts per billion

SAMPLING AND ANALYSIS OF PRESENT AND POTENTIAL DRINKING WATER SUPPLIES IN LENOX, MASSACHUSETTS, FOR CONTAMINATION WITH POLYCHLORINATED BIPHENYLS

Final Report

By I.C.T. Nisbet, Ph.D.
Director, Scientific Staff, Massachusetts Audubon Society

Introduction

This report describes the results of sampling of surface and ground waters in Lenox, Massachusetts, and their analysis for contamination with polychlorinated biphenyls (PCBs). The sampling was undertaken in response to reports that the Massachusetts Department of Environmental Quality Engineering (DEQE) had intermittently detected very high concentrations of PCBs in Schweitzer Well No. 3, a possible source of ground water to augment the town's present surface water supplies. The sampling was designed to test not only water from Schweitzer Well No. 3, but also the present water supply of the town, a potential new surface source, and one sample of melting snow (the ultimate source for both surface and ground waters). Very careful precautions were taken to minimize the possibility of contamination of the samples with PCBs during collection and analysis, a notorious problem which has rendered many reported measurements of low levels of PCBs in water suspect.

Sampling and Analysis

Sampling was conducted on April 11, 1978, by the writer. Observers were D. Blanchard and L. McAllister of the Massachusetts Audubon Society, W. Schwartz of DEQE, and P. Kolodziej representing the Tri-Town Health Department. G. Darey, a Selectman of the Town of Lenox, observed the collection of one sample.

Samples were collected and the PCBs extracted by an *in situ* method devised by scientists at the University of California and described in a published report by R.W. Risebrough *et al.*[1] Water was collected in stainless steel containers, previously washed thoroughly with detergent and rinsed four times with pesticide-grade acetone; containers were again rinsed two or three times with pesticide-grade acetone in the field immediately prior to each sampling. The water was immediately passed through a stainless steel column (60 mm i.d., 280 mm long) containing 5 polyurethane foam plugs which had been previously Soxhlet-extracted with acetone in the laboratory prior to dispatch. Because pumps were not available in the field, the water was passed through the columns under gravity: this limited the rate of filtration so that only about 10 liters of water could be sampled at each station, rather than the 100 liters that are desirable to obtain maximum sensitivity.

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1. Risebrough, R.W., B.W. de Lappe, and W. Walker II. 1977. Transfer of low molecular weight chlorinated hydrocarbons to the marine environment. Pp. 261-321 in Marine Pollutant Transfer (H.L. Windom and R.A. Duce, eds.). Lexington Books, Lexington & Toronto.

Immediately after filtration the columns were wrapped in aluminum foil, frozen, and sent on dry ice to the University of California laboratory at Bodega Bay, where they were analyzed by Dr. R.W. Risebrough of the Bodega Institute of Pollution Ecology. The columns were extracted with acetone and hexane. The hexane fraction was cleaned up with sulfuric acid and fuming sulfuric acid, and the extract was analyzed by gas chromatography, with and without saponification.[2] (Saponification removes p,p'-DDT and a number of other interfering substances.) PCBs were quantified approximately by matching the gas-chromatographic profiles of the sample extracts with those of standard samples of Aroclors 1254 and 1248. For matches to Aroclor 1254, three late-emerging components (pentachlorobiphenyls) were used and the sums of the heights of the three peaks in the gas-chromatographic profiles were compared. For matches to Aroclor 1248, three characteristic components (tetrachlorobiphenyls) were compared similarly. Matching a gas chromatographic profile to Aroclor 1248 means simply that the residues found in water contained a substantial fraction of tetrachlorobiphenyls. It does not imply that the residues were derived from Aroclor 1248, because the same components are also found in Aroclors 1254, 1242, and 1016.

Although the "blank" sample resembled Aroclor 1254 in profile, several water samples had proportionately more of the earlier components (tetrachlorobiphenyls) and have accordingly been matched to a 1:1 mixture between the two. Unfortunately the earliest peaks (trichloro- and some tetrachlorobiphenyls) were not clearly resolved from interfering substances at the nanogram levels found in these water samples. If present, trichlorobiphenyls would not have been incorporated into the quantitative estimates of PCB concentrations in this report, which may therefore be too low.

Six samples were collected in the course of the day, as follows:

A. Water from the Yocum Brook in Pleasant Valley (a proposed new source of water for the Lenox municipal water supply). 10 liters of water were sampled.

B. Blank Sample. The collection procedure was identical to that for sample A, except that only 0.15 liters of water were passed through the filter. The purpose of collecting a "blank" was to investigate whether there might be any contamination of the equipment, in addition to PCBs in the water being sampled.

C. Snow, Pleasant Valley. Snow from the hillside above and to the south of the River at Pleasant Valley was collected and melted in a stainless steel container (immersed in a bucket of hot water to

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2. The analytical procedure is described more fully in ref. 1. A fuller account incorporating recent revisions in procedure is currently in preparation and will be published shortly.

minimize contamination from other equipment). A total of 7.47 liters of water was collected in this way and extracted through a polyurethane-packed column.

D. Schweitzer Well No. 3. 10 liters of water were sampled.

E. Woolsey Reservoir (secondary water source for the Town of Lenox). 12 liters of water were sampled.

F. Tap Water. 10 liters of water were sampled.

Results and Discussion

The results of the sampling and analysis are given in Table 1.

Blank Sample. The "blank" sample contained small quantities of PCBs which closely resembled Aroclor 1254 in gas-chromatographic profile. The total quantity was estimated to be about 12 nanograms (ng).[3] If this is regarded as "background" contamination it would correspond to a concentration of 1.2 nanograms per liter (parts per trillion) in a 10 liter sample. This may be regarded as the limit of sensitivity of the sampling and analytical procedures.

Schweitzer Well No. 3. The sample from Schweitzer Well No. 3 contained small amounts of PCBs, but the estimated total quantity was less than in the blank sample. The profile of this sample did not match either Aroclor 1254 or Aroclor 1248, but contained a disproportionate quantity of two components common to both. (See Figure 2.)

Surface Water Samples. All surface water samples contained PCBs at levels in the low parts per trillion. The quantities found were 2 - 5 times higher than those found in the blank, and in two cases differed in profile also. Hence there is little doubt that the PCBs found in the samples were actually present in the water and that only a small fraction can be explained as having arisen from contamination. The Lenox tap water sample contained about 3 parts per trillion of PCBs, which resembled a mixture of Aroclors 1254 and 1248. Water from Woolsey Reservoir contained somewhat larger quantities of PCBs, estimated at about 5 parts per trillion. The chromatogram of this sample showed a reasonable match to Aroclor 1254, but there was one unidentified component which emerged just after the pentachlorobiphenyls. (See Figure 1.)

The sample from Yocum Brook apparently contained a more complex mixture of chemicals. By matching the late-emerging components to Aroclor 1254 the concentration of PCBs was estimated to be about 2 - 3 parts per trillion. However, this is an underestimate of the total quantity of

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3. This is somewhat larger than in blank samples previously run through this procedure in the same laboratory, which usually contain 5 nanograms or less.

TABLE 1

Results of Sampling for PCBs in Water, Lenox, Massachusetts

Sample	Volume Collected (liters)	Estimated Total PCBs (nanograms) Matched to Aroclor 1254	Estimated Total PCBs (nanograms) Matched to Aroclor 1254/1258 mixture	Comments on shape of Chromatogram	Estimated Concentration (parts per trillion)
A. Yocum Brook	10	23	23	Large early peaks not resolved. Two large unidentified components	2.3
B. Blank	0.15	12	10	Good match to Aroclor 1254	-
C. Melted Snow	7.47	530	580	Reasonable match to Aroclor 1254 Additional large peak, probably DDE One unidentified late peak	77
D. Schweitzer Well No. 3	10	5	10	Poor match to both Aroclors	1.0
E. Woolsey Reservoir	12	63	52	Reasonable match to Aroclor 1254 One unidentified late peak	5.2
F. Tap Water	10.5	28	33	Reasonable match to 1254/1248 mixture	3.2

PCBs present, because a number of early-emerging components were not fully resolved. An unidentified late component similar to that in the Woolsey Reservoir sample was also present. In addition, there were very large quantities of two other unidentified components, one of which had a retention time similar to that of tetrachlorobiphenyls, the other similar to hexachlorobiphenyls. The latter component was probably present at a concentration in the parts per billion range. Both peaks disappeared on saponification. Further identification was not attempted, but they may perhaps have been phthalate esters. (See Figure 4.)

Snow. Melted snow contained much higher quantities of PCBs (70 - 80 parts per trillion) than any surface water sample. The PCB profile matched that of Aroclor 1254 reasonably well, although early components were not well resolved. In addition, there was a large component of p,p'-DDE, which was not detected in the water samples. Another unidentified component was present, similar to that found in the samples from Yocum Brook and Woolsey Reservoirs. (See Figure 3.)

Conclusions

1. Schweitzer Well contained smaller quantities of PCBs than any other water source sampled. The concentration of PCBs in the well water was not greater than 1 part per trillion and actually less than in the "blank" sample.

2. All surface water samples, including Yocum Brook and the existing town water supplies, contained PCBs at concentrations in the range of 1 - 5 parts per trillion.

3. Yocum Brook also contained a much larger quantity of two unidentified chemical contaminants.

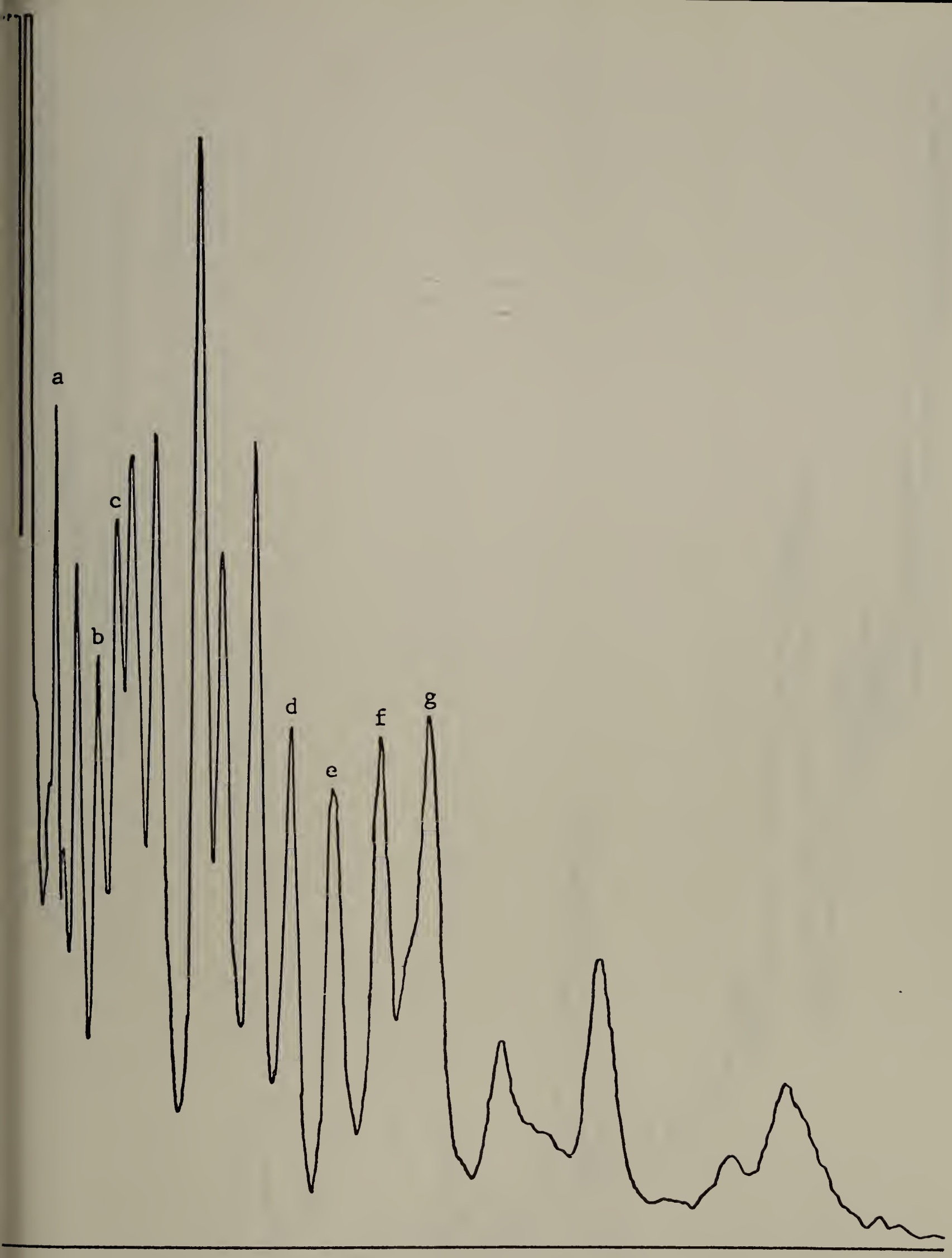
4. Melting snow contained much higher concentrations of PCBs than surface waters. This suggests that much of the PCBs falling in rain and snow are adsorbed to the soil or organic matter before they reach the rivers and enter the water supply.

5. Melting snow also contained DDE and at least one other unidentified contaminant.

6. These results do not necessarily refute earlier reports that PCBs may have been present in Schweitzer Well No. 3 at times in the past. However, the occurrence of PCBs in water from a deep well is inherently unlikely. In my opinion, the reports of PCBs in Schweitzer Well No. 3 should not be accepted unless they are confirmed by comparably careful sampling and analytical techniques, including the use of blank samples.

ICTN/sab

November 9, 1978



gure 1. Gas chromatogram of extract from water from Woolsey reservoir.

a,b,c: components used for matching to Aroclor 1248 (tetrachlorobiphenyl
d,e,f: components used for matching to Aroclor 1254 (pentachlorobiphenly
g: unidentified component

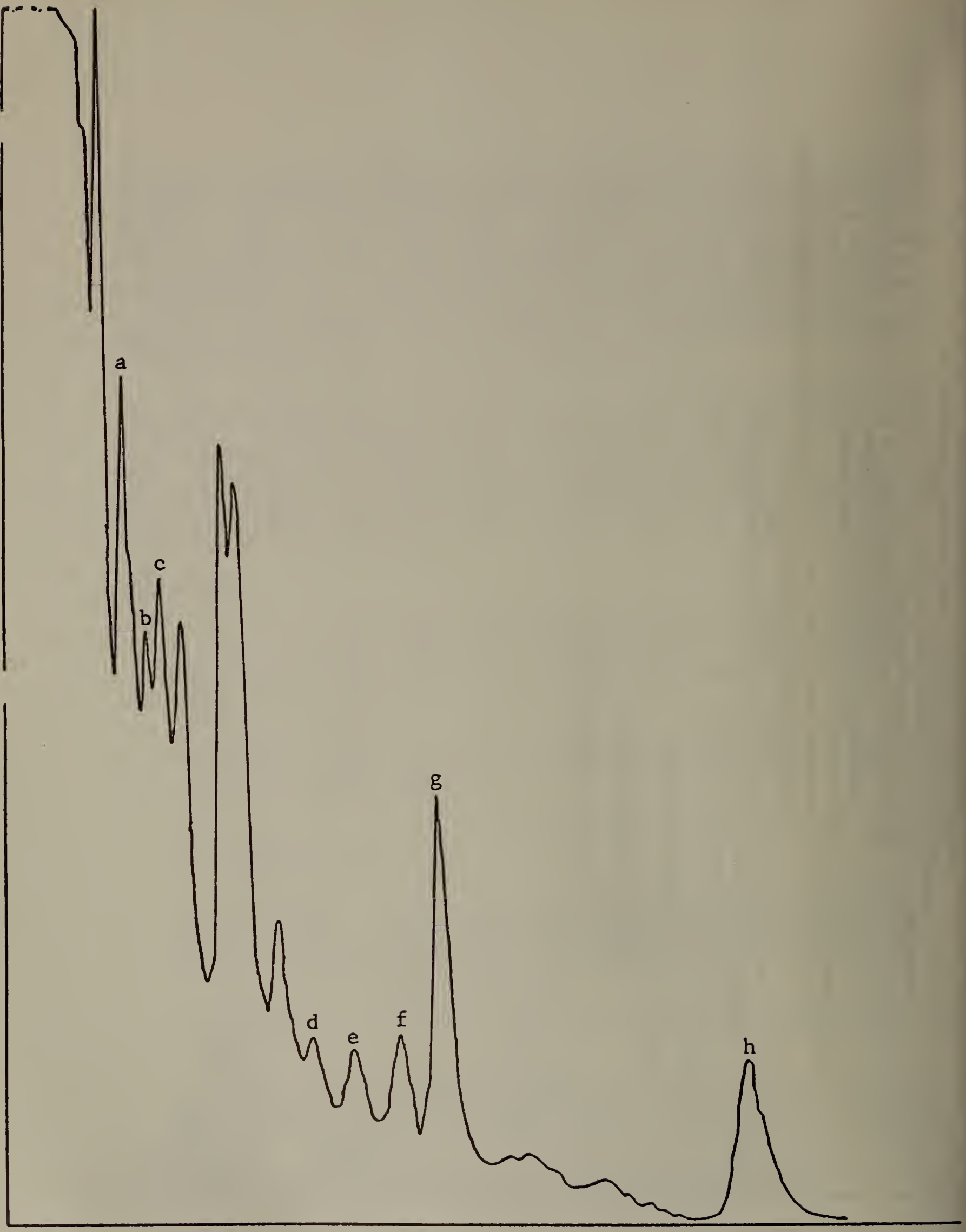
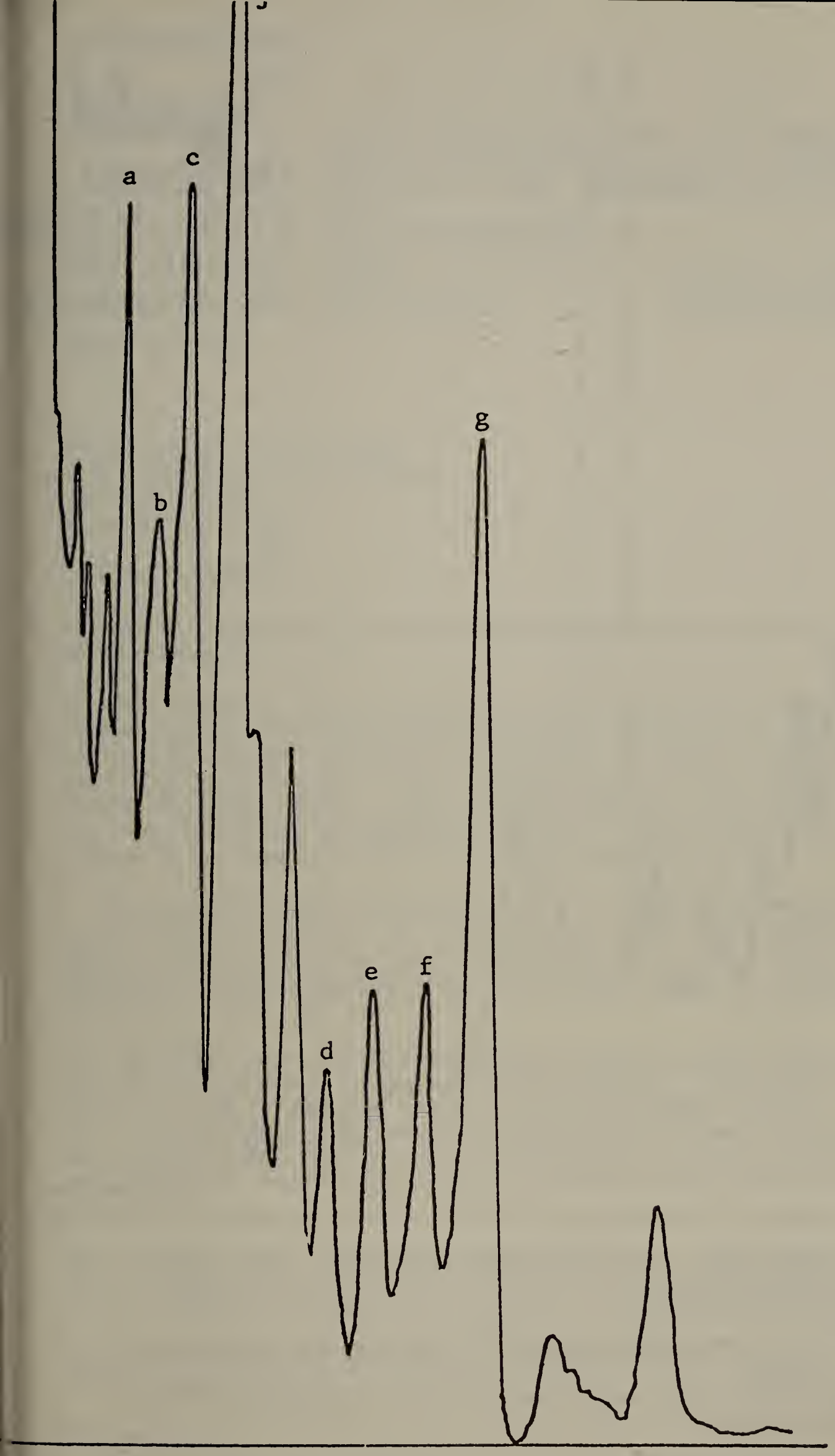


Figure 2. Gas chromatogram of extract from water from Schweitzer Well No.

a,b,c: components used for matching to Aroclor 1248 (tetrachlorobiphenyls)
d,e,f: components used for matching to Aroclor 1254 (pentachlorobiphenyls)
g,h: unidentified components



gure 3. Gas chromatogram of extract from melted snow, Pleasant Valley.

,b,c: components used for matching to Aroclor 1248 (tetrachlorobiphenyls)
e,f: components used for matching to Aroclor 1254 (pentachlorobiphenyls)
g: unidentified component
i: p,p'-DDE

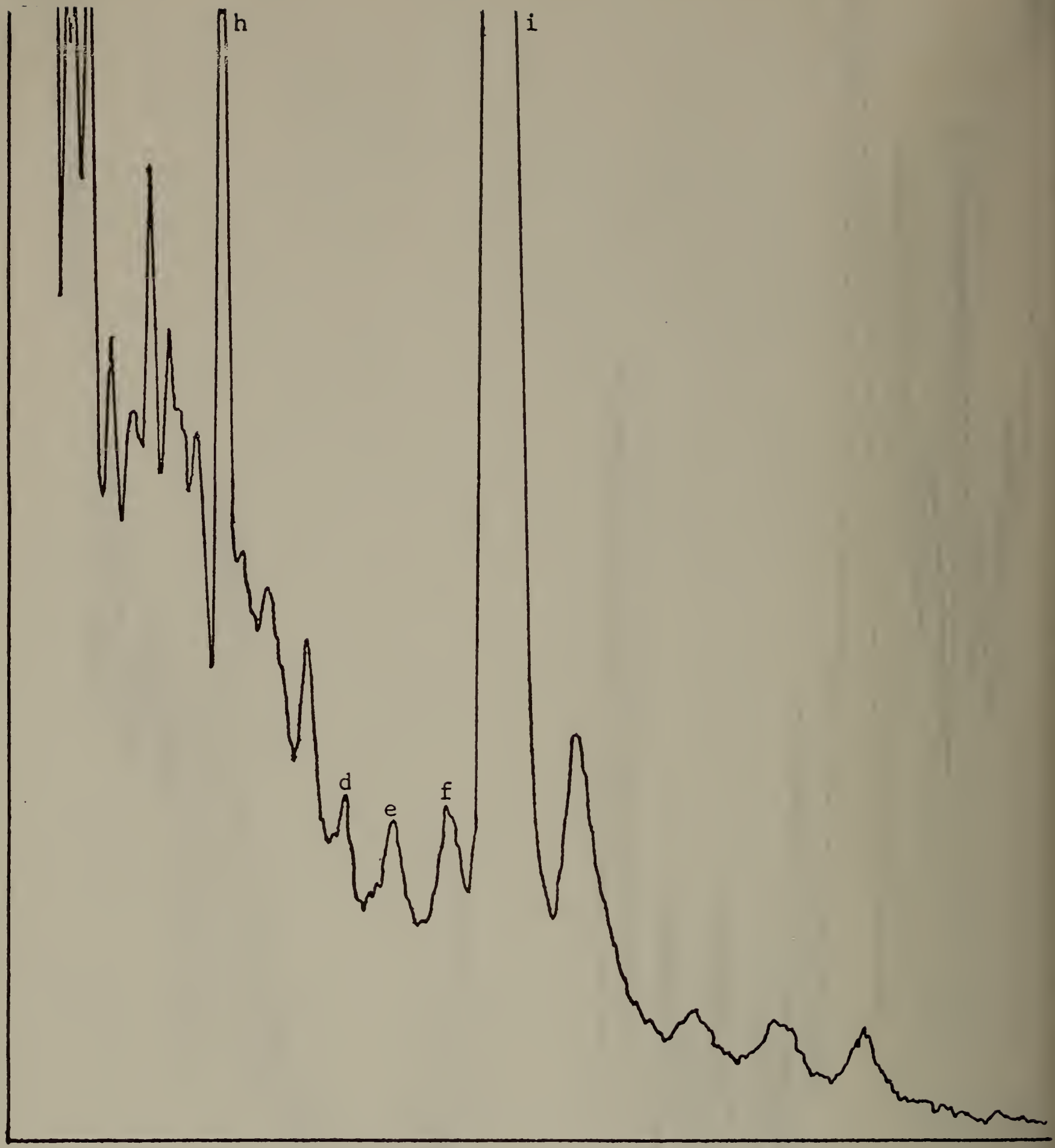


Figure 4. Gas chromatogram of unsaponified extract from water from Yocum Brook.

d,e,f: components used (after saponification) for matching to Aroclor 1254

h,i: large unidentified components which disappeared after saponification

Note: saponification removes components such as h and i, and other interfering compounds, making PCBs easier to identify and quantify.

SSACHUSETTS
HISTORICAL
COMMISSION

COMMONWEALTH OF MASSACHUSETTS
Office of the Secretary of State

294 Washington Street
Boston, Massachusetts
02108
617-727-8470

MICHAEL JOSEPH CONNOLLY
Secretary of State

March 19, 1981

Frank Resides, Staff Leader
U.S. Department of Agriculture
451 West Street
Amherst, MA 01002

Dear Mr. Resides:

I enjoyed meeting with you and discussing the SCS project at Washington Mountain Brook with you.

1) MHC concurs with SCS's opinion that the Washington Mountain Brook Historic Archaeological District meets criteria for listing in the National Register of Historic Places. The sites included in the area have the potential for contributing information about the depopulation of Massachusetts upland areas during the 19th century. Sites include remains of domestic, commercial, public, and industrial properties all dating to the 18th -19th century. They appear to be largely undisturbed and to retain integrity.

SCS should forward documentation on the Washington Mountain Brook Historic Archaeological District and a copy of this letter along with a statement of SCS's opinion on National Register eligibility to the Keeper of the National Register, Heritage Conservation and Recreation Service, Pension Building, Washington, D.C. (36 CFR 800.4).

2) MHC staff have reviewed development plans as they impact the Washington Mountain Brook Historic Archaeological District. No archaeological properties will be directly impacted by the proposed watershed projects. Several sites are located adjacent to areas of construction. These sites should be flagged and construction activity should be directed away from the sites. The specifications for the project should include instructions for avoiding these site areas.

MHC concurns with a determination of "no effect" (36CFR 800.4) to the Washington Mountain Brook Historic Archaeological District. A copy of this determination should be included in final environmental assessments.

If you have any further questions, please feel free to contact Valerie Talmage, State Archaeologist.

Sincerely,

Patricia L. Weslowski

Patricia L. Weslowski, State Historic Preservation Officer
Executive Director, Massachusetts Historical Commission

PLW/pb

United States Department of Agriculture
Soil Conservation Service
451 West Street
Amherst, MA 01002
Tel. (413) 256-0441

May 11, 1981

Executive Director
Advisory Council on Historic Preservation
1522 K Street NW
Washington, D.C. 20005

Dear Sir or Madam:

Re: Washington Mountain Brook Watershed
Berkshire County, Mass.

It has been determined that installation of the remaining measures planned for the Washington Mountain Brook Watershed will have "no adverse effect" on identified archeological and historical resources of the watershed. Prior to construction, these resources will be flagged and construction specifications for the project will address their protection and avoidance.

A letter from the Massachusetts Historical Commission concurring in the above determination is attached. Additional information enclosed to document this finding include:

1. A copy of Public Law 83-566 the Watershed Protection and Flood Prevention Act which authorizes this agency to provide technical and financial assistance to sponsors of watershed projects.

2. Supplemental Watershed Plan #4 for the Washington Mountain Brook Watershed. This describes the nature of the project, its purposes, and federal and nonfederal costs.

3. A project map.

4. A copy of the Archeological Survey Report for the watershed by John Pretola, 1975.

5. A copy of the NRHP - Nomination Forms including a map of the proposed Archeological/Historical District.

6. A copy of the Determination of Eligibility by the Keeper of the National Register of Historic Places.

None of the properties within the Archeological/Historical District will be altered or destroyed by construction activity in the watershed. Alteration of the Archeological/Historical District's surrounding environment by the construction of multiple-purpose lakes will not be adverse. The entire project lies within the October Mountain State Forest and the planned measures will be compatible with existing landscape features. Neglect will not be a factor affecting the properties within the Archeological/Historical District.

All land in and surrounding the district will remain in state ownership. The impoundments created by the project will enhance the natural setting surrounding the district. Noise, dust, and other products of construction will be kept to a minimum as per construction specifications and these adverse effects will be of a temporary nature. The draft Environmental Impact Statement for this project has been reviewed and the final EIS is now being prepared.

I request your concurrence in the determination of "no adverse effect." If you have questions or require additional information about this project, please contact Frank Resides of this office.

Sincerely,

SHERMAN L. LEWIS
State Conservationist

Attachment 1
Enclosures 6

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BY

APPENDIX C

WATER AND RELATED LAND RESOURCE PROBLEMS

The following are excerpts from selected Town of Lee Annual Reports:

FLOOD OF NOVEMBER 1927

The town's appropriations were about exhausted when the flood came.

It was then a question of making the necessary repairs as soon as possible. Some of those were permanent, while some were temporary. Nine bridges were put back in permanent shape; two were made passable; one (Greylock street) was not touched, the street having been closed.

The road at May's bridge was rebuilt and a temporary embankemnt made to protect the road. The cement bridge at Woodlawn street was made passable for the winter at a heavy expense following the damage done by the flood. An entirely new road was built on Washington mountain from the E. Newton place to the See place. The rest of the road was repaired as far as the Washington town line. Three of the previously-mentioned bridges were on this road.

A new bridge will have to be built on Woodlawn street and the brook put back in its regular course.

FLOOD DAMAGE 1933

The flood of September this year caused considerable damage to roads and bridges. Three bridges were washed out completely and several others damaged. The newly-constructed road to the Mountain Mill stood up well, but the road from the mill to the Tyringham line was demolished in places. The road up Washington mountain was completely torn out but was replaced by Mr. McColloch and the CCC forces. The bridge at Church's in East Lee had to be completely rebuilt. The bridge near the McAllister farm had to be partially rebuilt. Several large wash-outs, adjacent to brooks, had to be filled in again. And several small culverts completely rebuilt. We still have three bridges on the Washington mountain stream to rebuild. The CWA workers are working on the abutments of one of them at the present time.

REPORT OF FLOOD OF SEPTEMBER 21, 1938

On September 21, 1938, the town of Lee experienced one of the worst floods in its history. After two days of almost continuous rain which filled reservoirs and ponds to overflowing and raised all streams to a dangerous flood state, the 21st brought continued rain with occasional cloud-bursts, and the run-off was so tremendous that the capacity of dam spillways was exceeded, regular stream channels could not carry the water and everywhere overflowed their banks; bridge openings were not large enough to carry the flood and bridges were either wiped out or the water went around the abutments, washing out the roads and damaging the bridges themselves, and stream channels became loaded with debris of all kinds.

Every available man that could be used by the Highway Department was busy sand-bagging, trying to keep roads open, patrolling washed-out roads and flooded areas, and helping families within the flooded areas.

Four temporary vehicle bridges were erected, seven vehicle bridges were temporarily repaired, and all roads with the exception of Washington Mountain road were made passable in less than three weeks' time.

Aid was sought from the Department of Conservation through Commissioner Dean for help in repairing town roads bordering on or passing through the State Reservation, and for the dredging of Washington Mountain brook. The Commissioner sent a fleet of ten trucks for our use, under the supervision of Mr. William McCullock, who is in charge of October Mountain State Reservation.

A grant of $850 was secured from the County Commissioners and $750 secured from the town reserve fund to dredge out Washington Mountain brook from the Housatonic river to Newton bridge.

REPORT OF FLOOD OF JANUARY 1, 1949

On the night of December 31, 1948, and January 1st, 1949, after rains fell over a period of three days, the Town of Lee was again in the throes of damaging flood waters. Perhaps not so destructive in places hit before, however, the water reached a record high and flooded areas never before covered. It is frightening to think what tremendous devastation would have occurred had not the drought in the summer and fall of 1948 reduced the amount of water in the surrounding ponds and reservoirs. These basins acted as flood storage dams to hold the amount of water from the acres of surrounding watershed which otherwise would have gone down the streams washing everything ahead of them. The fact that Reservoir Brook and Greenwater Pond Brook were not as destructive in this flood as in previous ones, is based on the low level of the ponds feeding these brooks, whereas, Washington Mt. Brook with no basin at the top of the mountain at its source to store the tremendous water shed, raised havoc on its downward plunge to the Housatonic river filling the bed and under bridges with gravel and boulders, and washing out meadows and sections of roads. This Brook will never be checked until some form of flood dam is constructed on Washington Mt. to check the runoff from the water shed area.

Coming in the winter as it did repairs to highways and bridges had to be rushed before snow conditions hampered the operations. It was heartening at this time of the year to have mild weather and light snow experienced so that we were able to make temporary repairs to highways, bridges, and stream beds so that every road was passable except Woodland Street at the Washington Mt. Brook Bridge, where a section of the road was out, due to the stream leaving the bed which was filled above ground level.

Large washouts occurred on Washington Mt. Road, Woodland Road, Mill Street, ...

STREAM CLEARANCE (1948)

This represents a costly proposition; where the money is coming from is the controlling factor. Something has got to be done, nevertheless. A power shovel was placed in Washington Mt. Brook and another in Greenwater Pond Brook at the Tyringham Road Bridge to relieve immediate emergency, but further work could not be accomplished inasmuch as financial aid could not be assured from the State.

The Washington Mt. Brook will require excavation for 3000 feet to bring the stream back in its bed and under the bridge on Woodland Road, numerous landslides and trees to be removed above Newton Bridge and rip rap, and retaining wall; a $60,000.00 project.

STREAM CLEARANCE (1949)

As it was necessary to do something on Washington Mt. Brook and Greenwater Pond Brook before anticipated spring rains, two power shovels were employed to clear the beds near Mill St. and below Tyringham Road Bridge. For this work $684.00 of the Flood Emergency money was used, and then the work was taken over by the State by contract with Petricca Construction Co. and paid by the State. Funds being limited the amount of dredging and stream clearance necessary could not be done, although splendid work was accomplished on both brooks and clearing under bridges accomplished. The State Department also undertook the repair of the abutments on Newton Bridge, Washington Mt. Road and repair of washout on Woodland Road.

The opening month of the year 1949 brought a great many problems to this Department. On December 31st, 1948, probably the worst flood ever to be experienced in the town caused a tremendous amount of damage to our water system. The intake dam on Washington Mt. Brook and an eight inch main at Newton's Bridge nearby were washed away.

To replace the dam on Washington Mt. Brook was out of the question, because of the season of the year. However, sand bags were placed around it to hold water in as much as possible until something more permanent could be done.

CHAPTER 90 FLOOD EMERGENCY - 1950

During the storm of November 25th and 26th the Washington Mt. Brook once again raised havoc with the brook bed, bridges, highways and private property on Woodland Road, Washington Mt. Road, and Mill Street. A section of the Washington Mt. Road was washed out and will not be repaired until spring. Damage to abutments of the bridges on this road are extensive and have virtually placed the bridges in a condition making new construction inevitable in the near future.

Work was started immediately on the washouts on Mill Street, Woodland Road, Washington Mt. Road, and excavation of the brook bed, to get the water back into original course, while negotiations were conducted with the State Department of Public Works for funds to make emergency repairs. A sum of $3000.00 was allowed by the State and the balance of this amount will be used in the spring to complete the repairs.

Efforts were made through the Board of Selectmen and County Commissioners to have the State make a complete survey of this brook to try to eliminate this periodic damage, by the possibility of raising of bridges where necessary and straightening of the brook to allow a quicker flow off of water. The State officials felt such an extensive expenditure was hardly warranted, but that an effort would be made to relieve the condition if possible to prevent private and public destruction of property.

Considerable damage resulted on two culvert bridges on Woodland Road and have been partially repaired. Washouts have been gravelled in part and will be completed in the spring.

On November 25th, the Berkshires was visited by a rain and wind storm which did extensive damage to homes, roads and utilities. The Water Department did not escape. The brook at Washington Mountain became, as always, a raging torrent and washed dirt and debris down upon our equipment. The chlorinators both there and at Vanetti were out of order for several days. It was necessary to ask all users to boil the water. Repairs to get things back in working order were made as quickly as possible, but much remains to be done in the spring.

AUGUST 1955

The floods of August 18th and 19th did some damage to our rivers and streams. As a result, Army Engineers and engineers from the Division of Waterways, Department of Public Works made surveys of the rivers and streams in the town. Flood relief funds were received for emergency repairs to the affected areas. An Army Engineer contract was made for further repair work on bridges on the Washington Mountain Brook.

Spring came and with it heavy rains and washouts and surface breakups. Early summer was more or less the same which did not help matters, putting a crimp in our early maintenance and behind on our schedule. Our gravel roads at this time took a terrific beating. Pot holes appeared from nowhere. Grading some roads seemed a continuous project especially where traffic was heavy. A long dry spell came along, and to expel this condition the rains fell again and in August we experienced another flood. We were fortunate however in that the heavy rains were south of us, although we did get six inches of rain in two days. As usual Washington Mt. Brook went on a rampage, filled the water ways under bridges, overflowed banks and washed road surfaces. Meadow Street was inundated longer than ever before caused by the heavy runoff this side of Otis and Tyringham. With aid from State

funds, washouts and stream clearance on Washington Mt. Brook, Mt. Mill Road, and Fernside Road were taken care of.

The almost total lack of rainfall in the latter part of June, all of July and the first half of August reduced the natural brook flow and the level of the main reservoir to such an extent that the use of water to consumers had to be curtailed over an extended period. Then on August 16th and 17th came the flood. The intake dam at Washington Mountain Brook was completely filled with rock and gravel and the pipe line put out of service. It was necessary to dredge out the dam and intake pit before this line could be used again.

1956

We were able to accomplish the reopening to traffic of Washington Mountain Road. It had been closed for the past few years. This was due to the fact that the Federal Government with a Federal Grant supplied the funds to replace a bridge that had been washed out. Cost of this replacement was approximately $7,500.00. Funds were also received through a Federal Grant to clear the Washington Mountain Brook of debris. We were most grateful for this assistance.

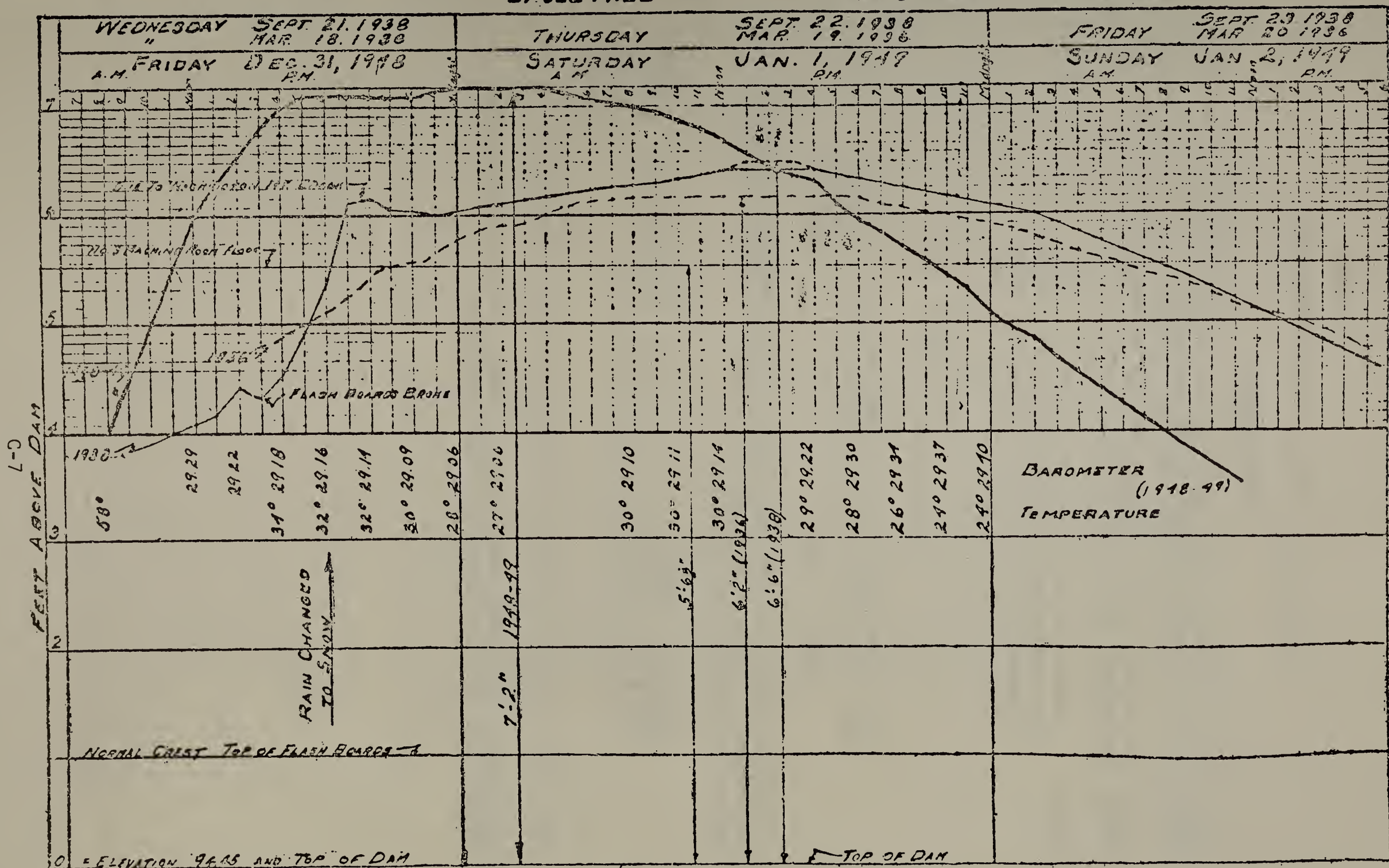
Undercutting of foundation by floodwaters along Washington Mountain Brook at Woodland Street. Flood of 1914, photo courtesy of Lee Public Library.

Scoured and debris ladened grounds of property north and adjacent to Newton Bridge, following flood of September 1938. Photo courtesy of William Newton.

Washington Mountain Road between Newton Bridge and Woodland Street following flood of September 1938. Photo courtesy of Mrs. Elva Munson.

JAN 15 1949

FLOOD WATER CHART AT EAGLE MILL 1936 & 1938 — 1948-49



A STORY OF THREE FLOODS: A comparison of the three floods of 1936, 1938, and 1948 was offered today by Smith Paper Inc. of Lee which recorded the water levels at the Eagle Mill dam during the three flood years. The recent flood provided the highest water by far as can be seen by tracing the path of the heavy black line which sweeps up, in almost a perfect parabola. The lighter solid line represents the water rise in 1938, while the broken line is the path taken by the 1936 flood. The chart includes the temperature and barometric pressure during the hours of high water, and the hours of the day are recorded just below the dates at the top of the graph. The bottom line of the chart represents the top of the dam, and next line above is the normal height of the water flowing over the dam.

C-7

Recreational Fishing - Present Capacity

SCORP Region I

Since the 1978 SCORP figures represent a complete reversal of the 1976 SCORP figures, a check of computations was made.

The following basic data was obtained from the Department of Environmental Management, Office of Planning:

Region I	Nonurban miles of stream fisheries:	111*
	Urban miles of stream fisheries:	None
	Nonurban access of lakes and ponds:	7639*
	Urban access of lakes and ponds:	None

Capacity Computations

111 miles x 528.8 activity days/mile/yr =	58,697
7639 acres x 66.1 activity days/acre/yr =	504,938
Region I Total	563,635

If 1,000 acres of the ponds and lakes were considered to be urban (approximately the acreage considered urban for boating in Region I), the capacity would be as follows.

1000 acres (Urban) x 594.9 activity days/acre/yr =	594,900
6639 acres (Nonurban) x 66.1 activity days/acre/yr =	438,838
111 miles x 528.8 activity days/mile/yr =	58,697
Total	1,092,435

This value of about 1,000,000 activity days appears reasonable.

Therefore, the current unmet demand is about 500,000 activity days, or 400,000 more than the estimate in the 1976 SCORP.

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*Same as in 1976 SCORP.

APPENDIX D

ENVIRONMENTAL IMPACTS

EUTROPHICATION CALCULATIONS

In any program involving the construction of an impoundment, the future quality of the lake is a critical issue. Within the last ten years researchers concerned with eutrophication problems in lakes have begun to develop predictive techniques for assessing the trophic status of lakes. Two concepts have been fundamental in this development, 1) the realization that the entire watershed, and not just the lake and its shoreline, is the basic ecosystem unit, and 2) the identification of phosphorus as the plant nutrient most frequently limiting primary production in north temperate lakes (Dillon and Rigler, 1975). Vollenweider (1968) reviewed a large portion of the available literature on lakes, particularly in northern Europe, and concluded that a graphical analysis of total annual phosphorus loading (L) vs mean depth (z) was sufficient to allow lakes to be classified into the three standard categories of oligotrophic, mesotrophic, and eutrophic. This early approach was modified by Vollenweider in 1973 to include a consideration of hydraulic retention time (Dillon and Rigler, 1975). Vollenweider (1975) has expanded his original concepts and greatly improved the mathematical basis for his conclusions. Dillon (1975), Dillon and Kirchner (1975), and Dillon and Rigler (1975) have investigated Vollenweider's concepts and related them to field studies conducted on Canadian Shield lakes. They have developed a simple predictive model which relates the annual total phosphorus load (L) to a lake's trophic state. The formulation was first presented in Dillon (1975) and is currently the best available method for predicting the future trophic status of lakes. SCS (1975) has formulated a model based on Vollenweider's (1973) approach. This model does not include specific aspects of the more recent works cited here.

All of the predictive models discussed here are based on the assumptions that the total phosphorus concentration in a lake can be related to levels of primary productivity and that this concentration can be predicted from an estimate of the hydrologic and phosphorus budgets of the lake. Sawyer (1947) determined that algal blooms could be expected to occur in a lake if the concentrations of inorganic phosphorus and inorganic nitrogen exceeded 0.010 mg/l and 0.300 mg/l, respectively, at spring turnover. These criteria were expanded by Vollenweider (1968) who concluded that lakes with a total phosphorus concentration below .010 mg/l were oligotrophic,

lakes with concentrations between .010 mg/l and .020 mg/l were mesotrophic, and lakes with concentrations exceeding .020 mg/l were eutrophic. These values were subsequently accepted by Dillon (1975) and are used here to establish lake water-quality standards.

The model proposed by Dillon (1975) is based upon the assumption that when a lake is in steady-state equilibrium the total phosphorus concentration in the lake water is directly proportional to the loading rate and the phosphorus retention coefficient, and inversely proportional to the mean depth of the lake and the flushing rate. This relationship is summarized in the equation

$$[P] = \frac{L(1-R)}{z\,\rho}$$

where [P] = Total phosphorus concentration in the lake [g/m^3]
L = Annual phosphorus areal loading rate to lake [$g/m^3/yr$]
R = Phosphorus retention coefficient
z = Mean depth (m)
and ρ = Flushing rate ($year^{-1}$).

If [P] is assumed to equal .010 g/m^3 (oligotrophic limit), it is possible to predict a threshold areal loading rate (L) which can be compared to actual, or predicted, inputs to the lake. The evaluation of the parameters of the equation are dependent on the development of a water and a phosphorus budget for the lake. The accuracy of the prediction is subsequently dependent upon the accuracy of these data.

The Dillon (1975) model was used to predict the trophic status of the three lakes involved in this project. The calculations for each lake follow this discussion. The procedures used are outlined below.

- SCS work plan and pool designs were consulted for the following; mean depth, lake area, and drainage basin area. The beneficial-use pool figures were used in all calculations.

- A water budget for the lake was constructed. The generalized equation used was,

$$Q = A_d \cdot r + A_o (Pr-Ev)$$

where Q = total outflow volume per year
A_d = area of the drainage basin (m^2)
r = long-term average areal discharge ($m^3/m^2/yr$)
A_o = area of the lake (m^2)
Pr = direct input via precipitation
Ev = loss by evaporation.

This formulation does not include any consideration of groundwater in the water budget. In most reported studies, groundwater contributions have been negligible in relation to the total budget.

Flow data taken during this study were insufficient for an estimation of yearly flows. Records from two USGS gages on small watersheds in the vicinity of the Washington Mountain Brook watershed were examined to estimate areal mean flows. The gages were on Walker Brook (USGS 01180800) and Marsh Brook (USGS 01197300), with drainage areas of 7.80 km^2 and 5.67 km^2 respectively.

The gage on Marsh Brook was discontinued shortly before this study, but the gage on Walker Brook was active during our study. Flow data taken at Station 8, immediately downstream from Washington Mountain Lake dam, were compared to flow data provided by USGS. Seven flow measurements were obtained at Station 8. On four of these occasions good flow records were obtained at Walker Brook. These readings are compared below:

AREAL DISCHARGE ($m^3/m^2/s$)

Date	Station 8	Walker Brook
Aug 14, 1975	2.74	.299
21	0.106	.150
28	0.301	.137
Sept 18	0.176	.162

Except for the August 14 measurements, these data are in reasonable agreement, although data from the two sites are not sufficient for a meaningful statistical comparison. They appear sufficient to support the use of a mean areal discharge value, which was calculated from the USGS records at Walker Brook and Marsh Brook. Based on ten years data from both sites, the areal discharge from the Marsh Creek drainage basin was 0.76 $m^3/m^2/yr$, and from the Walker Brook basin was 0.72 $m^3/m^2/yr$. The average long-term areal discharge for the two sites is 0.74 $m^3/m^2/yr$. This figure was used in calculating the water budget. Long-term average rainfall was obtained from the U.S. Weather Bureau station at Stockbridge (109 cm/yr, 30-year average). Evaporation rates were obtained from a graph of average annual lake evaporation (Linsley and Franzini, 1964) and was estimated to be approximately 69 cm/yr.

- The phosphorus budget of each lake was estimated from average values for nonpoint sources. Phosphorus may enter a lake in a variety of ways, which are summarized in Table C-10. Two of these mechanisms, septic tank seepage and point source discharges, are not applicable to these lakes. Groundwater contributions are assumed to be of minimal significance. The remaining two sources, surface water and precipitation, were estimated using data provided in Dillon and Rigler (1975), EPA (1974), and Uttormark, Chapin and Green (1974). These studies have indicated that mean annual phosphorus discharge from a watershed is dependent on land use and the physical and biological characteristics of the basin. The land use category (e.g., forest, cultivated farmland, urban, etc.) is particularly significant. Dillon and Kirchner (1975) have also discussed the significance of geology in this regard. They report that the mean export of total phosphorus from plutonic igneous watersheds which are forested is 4.8 $mg/m^2/yr$. Their values ranged from 2.5 to 7.7 $mg/m^2/yr$. Uttormark et al (1974) reported forest values (no geologic information) ranging from 5 to 80 $mg/m^2/yr$, with a mean export of 20 $mg/m^2/yr$. For the purpose of this study, a value of 10 $mg/m^2/yr$ was selected. This value is higher than Dillon and Rigler's (1975) reported maximum, but lower than the average reported by Uttormark et al (1974).

MODES OF PHOSPHORUS TRANSPORT TO LAKES,
[Source: Uttormark et al (1974)].

Mode of Transport	Entry to Lake	Contributions from
Groundwater	land-water interface	unknown portion of ground-water drainage basin
Surface water		
a) streamflow	inlet streams	direct drainage basin
b) streamflow	inlet streams	indirect drainage basin
c) overland flow	lake perimeter	immediately adjacent lands
Precipitation	lake surface	unknown
Dry fallout	lake surface	unknown
Septic tank seepage	inlet streams or lake surfaces	domestic wastes
Point source discharges	inlet streams or lake surface	municipal or industrial processes

Data on the phosphorus content of bulk precipitation are provided by Dillon and Rigler (1975) and Uttormark et al (1974). Bulk precipitation is defined as total of rainfall, snowfall, and dry fallout. Dillon and Rigler (1975) working in southern Ontario recommend a figure of 75 $mg/m^2/yr$, which is well within the range reported by Uttormark et al (1974). This value was used in this study.

- These data are sufficient to estimate the terms of the predictive equation. It must be stressed that the predictive capability of the model is only as good as the data used in its calculation. Any discussion based on theoretical values has a greater uncertainty than would be present if field data were available.

  In order to estimate the future trophic status of the lakes the terms of the predictive equation were calculated as follows:

$$L = \frac{A_d \cdot P_d + A_o \cdot P_p}{A_o}$$

where A_d = area of the drainage basin (m^2)
P_d = mean areal phosphorus load ($q/m^2/yr$)
A_o = area of the lake (m^2)
P_p = phosphorus contribution from bulk precipitation $q/m^2/yr$

$$z = (\text{mean depth}) \frac{(\text{lake volume})}{(\text{lake area})}$$

$$\rho = \frac{Q}{V}$$

where Q = total outflow volume per year
V = lake volume (SCS work plan)

$$R = 0.426e^{(-0.271q_s)} + 0.574e^{(-0.00949q_s)}$$

where $q_s = Q/A_o$

This relationship was developed by Dillon and Rigler (1975) as a means of estimating R in the absence of field data. It has been shown to be inaccurate at low q_s.

It is now possible to calculate a predicted mean total phosphorus concentration for the lake, which can be evaluated in terms of the criteria stated earlier; $\leq .010 g/m^3$, oligotrophic; $.010 g/m^3$ to $.020 g/m^3$, mesotrophic; and $>.020 g/m^3$ eutrophic.

The results for the three lakes are presented in Tables C-11, C-12, C-13, and may be summarized as:

Lake	Predicted Mean Total Phosphorus (g/m^3)
Washington Mountain Lake	0.009
October Mountain Lake	0.009
Schoolhouse Lake	0.011

These data indicate that all three lakes may be expected to be oligotrophic but that Schoolhouse Lake may approach a marginally mesotrophic state.

In any exercise of this type it is necessary to keep the limitations of the technique firmly in mind when interpreting the results. As Dillon and Rigler (1975) have pointed out, theoretical water budgets are often inaccurate for small watersheds, and the uncertainty in the phosphorus export figures and in the loading from precipitation could result in significant errors. In addition, the formula for estimation of R (phosphorus retention coefficient) has been shown to be subject to considerable error when q_s is low, as it is in two of the lakes (Dillon, personal communication). Extremely rapid flushing rates may also adversely affect the model. This suggests that residence time is event-related rather than regular and predictable. Even so, these calculations do provide some guidance, provided care is used in interpretation.

In this instance all three lakes should be marginally oligotrophic. Two of them, Washington Mountain Lake and October Mountain Lake, are approaching the mesotrophic threshold, while the third, Schoolhouse Lake, is slightly above this level. The phosphorus loading estimates included in these calculations are conservative, and it appears that no immediate problems exist

in these lakes. Care should be taken, however, to insure that phosphorus loadings to these lakes are not increased by changes in land use in the watershed or by increased human activity. No septic systems should be installed in the watersheds. Other activities, such as clearing of parking sites, fertilization of grasslands, construction of parking lots and/or recreational facilities, etc., should be carefully evaluated before development. Shoreline development and clearing should be discouraged. In the case of Schoolhouse Lake there appears to be little danger of a major eutrophication problem, due to the high flushing rate of the lake. With a mean residence time of 10 days it is considered unlikely that algal blooms will occur. This does not consider seasonal variation in flushing rate, which should be evaluated before extensive watershed modification is undertaken.

All three of these lakes are shallow, and while the model suggests all will be oligotrophic, it does not directly consider the impact of rooted aquatic vegetation. This is considered to be only a potential problem.

The conclusions are supported by observations made at Finnerty Pond, which, during the summer of this study, gave no indications of eutrohication. At the same time, however, Woods Pond, at the base of the October Mountain, is a vivid example of the potential problem, should the assimilative capacity of these lakes be exceeded.

TROPHIC STATE CALCULATIONS FOR WASHINGTON MOUNTAIN LAKE

DATA

Areal discharge	$0.736 m^3/m^2/yr$	
Lake area	224 acres	$= 906,493 m^2$
Drainage area	1.60 sq. mi.	$= 4,143,968 m^2$
Lake volume	3,225 acre ft	$= 3,978,001 m^2$
Mean depth	4.38m	

P load = $.010 g/m^2/yr$ P in Rainfall = $.075 g/m^2/yr$

1. $Q = A_d \cdot r + A_o (Pr-Ev)$

$Q = (4,143,968 m^2)(0.736 m^3/m^2/yr) + (906,493 m^2)(0.109 m/yr - 0.069 m/yr$

$Q = 3,086,220\ m^3/yr$

2. $L = \dfrac{A_d \cdot P_d + A_o \cdot P_p}{A_o}$

$L = (4,143,968 m^2)\dfrac{(.010 g/m^2/yr) + (906,493 m^2)(.075 g/m^2/yr)}{906,493\ m^2}$

$L = .120 g/m^2/yr$

3. $e = \dfrac{Q}{V}$

$e = \dfrac{3,086,220 m^3/yr}{3,978.001}$

$e = 0.78 yr^{-1}$

4. $R = 0.426e^{(-0.271 q_s)} + 0.57e^{(-0.00949 q_s)}$

$q_s = Q/A_o = 3,086,220/906,493$

$q_s = 3.40$

$R = .170 + .556$

$R = .725$

5. $[P] = \dfrac{L(1-R)}{Ze}$

$[P] = \dfrac{(0.120)\ (1-.725)}{(4.38)\ (0.78)}$

$[P] = .009 g/m^3$

TROPHIC STATE CALCULATIONS FOR
OCTOBER MOUNTAIN LAKE

DATA

Areal discharge	$0.736 m^3/m^2/yr$	
Lake area	90 acres	$= 364,217 m^2$
Drainage area	1.28 sq.mi.	$= 3,315,174 m^2$
Lake volume	1130 acre ft	$= 1,393,842 m^3$
Mean depth	3.8m	

P load = $.010 g/m^2/yr$ P in Rainfall = $0.075 g/m^2/yr$

1. $Q = A_d \cdot r + A_o(Pr-Ev)$

$Q = (3,315,174)(0.736) = (364,217)(0.109-0.069)$

$Q = 2,454,537 m^3/yr$

2. $L = \dfrac{A_d \cdot P_d + A_o \cdot P_p}{A_o}$

$L = \dfrac{(3,315,174 m^2)\ (0.010 g/m^2/yr) + (364,217 m^2)\ (.075 g/m^2/yr)}{364,217}$

$L = 0.166 g/m^2/yr$

3. $e = \dfrac{Q}{V}$

$e = \dfrac{2,454,537 m^3/yr}{1,393,842 m^3}$

$e = 1.76 yr^{-1}$

4. $R = 0.426e^{(-0.271 q_s)} + 0.574e^{(-0.0094 q_s)}$

$q_s = Q/A_o = 2,454,537/364,217$

$q_s = 6.74$

$R = .069 + .538$

$R = .607$

5. $[P] = \dfrac{L(1-R)}{Ze}$

$[P] = \dfrac{(0.166)\ (1-.607)}{(3.8)\ (1.76)}$

$[P] = .009 g/m^3$

TROPHIC STATE CALCULATIONS FOR SCHOOLHOUSE LAKE

DATA

Areal discharge	$0.736 m^3/m^2/yr$	
Lake area	15 acres	= $60,702 m^2$
Drainage area	3.27 sq.mi.	= $8,469,235 m^2$
Lake volume	140 acre ft	= $172,688 m^3$

Mean depth

P load = $0.010 g/m^2/yr$ P in Rainfall = $0.075 q/m^2/yr$

1. $Q = A_d \cdot r + A_o(Pr-Ev)$

$Q = (8,469,235)(0.736) + (60,702)(0.109-.069)$

$Q = 6,235,785$

2. $L = \dfrac{A_d \cdot P_d + A_o \cdot P_p}{A_o}$

$L = \dfrac{(8,469,235 m^2)\ (.010 g/m^2/yr) + (60,802 m^2)\ (.075 g/m^2/yr)}{60,702}$

$L = 1.47 g/m^2/yr$

3. $e = \dfrac{Q}{V}$

$e = \dfrac{6,235,785 m^3/yr}{172,688 m^3}$

$e = 36.1 yr^{-1}$

4. $R = 0.426e^{(-0271 q_s)} + 0.574e^{(-0.00949 q_s)}$

$q_s = Q/A_o = 6,235,785/60,702$

$q_s = 103$

$R = 0 + .216$

$R = .216$

5. $[P] = \dfrac{L(1-R)}{Zp}$

$[P] = \dfrac{(1.47)\ (1-.216)}{(2.84)\ (36.1)}$

$[P] = .011 g/m^3$

ESTIMATED BOATING USE

	October Mountain Lake	Washington Mountain Lake
Total Surface Area (acres)	90	224
Boating Area (acres)	29	127
Power Boating		
Capacity (Boating Area/10)	3	13
Turnover (Capacity x 1.5)	4.5	19
Annual Use (Turnover x 153)	689	2,907
Activity Days (Annual Use x 3)	2,067	8,721
Nonpower Boating (Desirable)		
Capacity (Total Area/6)	15	37
Turnover (Capacity x 1.5)	22.5	56
Annual Use (Turnover x 153)	3,443	8,568
Activity Days (Annual Use x 3)	10,329	25,704

APPENDIX E

WATER SUPPLY ALTERNATIVES

Town of Lenox, Massachusetts

Fifteen alternate water supply schemes for the town of Lenox have been reviewed and reanalyzed by Whitman and Howard Inc. A brief description of each scheme along with relevant rulings, costs, advantages, and disadvantages follows. The life of each project is the time period over which present and projected demand will be satisfied through development of the source.

It should be noted that the construction costs to follow are for spring, 1978 construction and do not include land costs, legal fees, etc. Also, the operational costs are based on meeting present water demands. As water demands increase, so will the operational costs. Costs for these alternatives have been updated to 1980 price base and are presented on page E-5.

1. Pleasant Valley

The Pleasant Valley site involves the construction of a dam and reservoir along Yokun Brook. The reservoir would flood 55 acres, all of which is owned by the Massachusetts Audubon Society. A 2 million gallon per day (MGD) water treatment plant would be constructed and 12,300 feet of 12-inch pipeline would connect the water treatment plant to the Aspinwall tank. The total cost of this project is estimated at $3,900,000 and the yearly operational cost would be $41,000. The combined safe yield of the existing Root Reservoirs and Pleasant Valley would be 1.6 MGD. This safe yield represents better than a 50 year life with respect to water quantity. The entire land acquisition is estimated at 72 acres for this project.

2. Fairfield Brook

This project requires the construction of a dam and reservoir in the town of Richmond. This site would flood 115 acres of land along Fairfield Brook and would inundate three homes. A 2 MGD water treatment plant and 23,500 feet of 12-inch pipeline would have to be constructed. The total project cost is estimated at $4,030,000 with a yearly operational cost of $42,000. This project would have a 40 year life, a safe yield of 0.74 MGD and require the purchasing of approximately 142 acres of land.

3. Geller Land (N/W Mountain Road

The Geller land site is located on the northwest side of Mountain Road in Lenox. This project involves the construction of a dam and reservoir having a water surface area of 101 acres. Better than 50 percent of this area is located in the City of Pittsfield. This site requires pumping Yokun Brook into the reservoir to develop adequate yield. A 2 MGD water treatment plant would be required along with 15,500 feet of 12-inch pipeline. This site along with the Root Reservoirs would provide a safe yield that would meet the town's water needs well beyond 50 years. The yearly operational cost would be $43,000 and the construction cost is estimated at $4,525,000. This project requires approximately 131 acres of land in Lenox and Pittsfield.

4. Felton Lake and Site 3

This project involves the diversion of excess flows from Site 3, on the Washington Mountain Brook Watershed Project, to Felton Lake. The Felton Lake dam and reservoir will have to be enlarged. An intake would be constructed at Site 3 and a 20-inch raw water transmission main would connect Site 3 to Felton Lake. A 2 MGD water treatment plant, 24,000 feet of 12-inch pipeline and a pressure reducing valve chamber would also be built. The total project cost is estimated at $6,414,000 and a yearly operational cost of $37,000. The combined safe yield of Felton Lake, Site 3 and the Root Reservoirs would be 1.3 MGD which represents a 35-year project life. Total land acquisition is estimated at 73 acres.

5. Ravine Above Woolsey Reservoir

This project involves pumping Yokun Brook into a dam and reservoir constructed in the ravine adjacent to Reservoir Road in Lenox. Due to the difference in elevation between this reservoir and Yokun Brook, two 4 MGD booster pumping stations and 9000 feet of 16-inch pipeline would be required to fill the reservoir. A 2 MGD water treatment plant and 12,000 feet of 12-inch pipeline would connect the supply to the proposed Aspinwall Storage Tank. The land acquisition for this project is estimated at 23 acres and the project life would be greater than 50 years. The total project cost is $7,360,000 and the yearly operational cost would be $55,000.

6. Rock Wells (Lime-Soda Ash Treatment)

This project involves the construction of deep rock wells in New Lenox at the base of October Mountain. Water quality is uncertain but will probably be very hard. Therefore, water softening will be required. The number of wells required to obtain a safe yield of 1 MGD is also questionable. As a matter of fact, this site may not even be capable of yielding 1 MGD. However, it could also yield considerably more.

This project requires the construction of deep wells, pumping stations, equipment, 8-inch raw water transmission main, 1 MGD lime-soda ash water softening treatment plant, 22,400 feet of 12-inch pipeline and a 1 MGD intermediate booster pumping station. The yearly operational cost is estimated at $78,000 and the initial project cost is estimated at $2,830,000. If the rock wells could be developed to a 1 MGD safe yield, the project life would be better than 50 years.

7. Rock Wells (Ion-Exchange Treatment)

This project is identical to the "Rock Wells (Lime-Soda Ash Treatment)" except for treatment as the titles suggest. Under this scheme, an ion exchange treatment process would be used in lieu of the lime-soda ash treatment process. The total project cost would be $2,450,000 with a yearly operational cost of $42,000. The major disadvantage of an ion exchange treatment process is the addition of sodium to the water. This

process exchanges sodium ions for calcium ions. The A.M.A. has recommended a maxiumum sodium limit of 20 mg/l for heart patients. A sodium concentration of better than 100 mg/l would exist from this supply if it was softened with the ion exchange process.

8. Vahle Land (S/W Mountain Road)

The Vahle Land project involves the construction of a dam and reservoir on the southwesterly side of Mountain Road in the Town of Lenox. This site would inundate three homes on Mountain Road. A 2 MGD water treatment plant of 15,500 feet of 12-inch pipeline would be required. The total project cost is estimated at $4,488,000, and the yearly operational cost would be approximately $78,900/ The projected project life is better than 50 years as the combined safe yield of the Root Reservoirs and the Vahle Land would be 2.26 MGD.

9. Foess Well (Lime-Soda Ash Treatment)

The Foess Well scheme involves the construction of a deep well in the town of Lee along the Housatonic River. The well would be drilled into limestone and yield hard water similar to that anticipated at the Rock Well Site in New Lenox. This project includes the construction of a well, 1 MGD lime-soda ash softening plant, 15,000 feet of 10-inch pipeline, ground storage tank and a 1 MGD booster pumping station. The estimated construction cost is $2,152,000 with a yearly operational cost of $75,000. If the well could actually be developed for 1 MGD, its projected life would be better than 50 years when combined with the Root Reservoirs. It must be noted that a letter from the Commonwealth of Massachusetts, Department of Public Health, Division of Environmental Health, dated March 10, 1975, ruled out this area by restricting ground water exploration to the areas between Willow Creek and Yokun Brook.

10. Foess Well (Ion Exchange Treatment)

This project is identical to the previously discussed project "Foess Well (Lime-Soda Ash Treatment)" except for the treatment process. Under this scheme an ion exchange process would be used in lieu of a lime-soda ash process. The operational cost would be approximately $39,000 per year and the initial construction cost would be $1,775,000. Again, with ion exchange, sodium levels will greatly exceed the A.M.A. recommended limit of 20 mg/l.

11. Raise Lower Root Reservoir

This project involves raising the existing Lower Root Reservoir to obtain a total safe yield of 1 MGD. Additional work required includes a valve chamber, 2 MGD temporary water treatment facility and 20,500 feet of 12-inch pipeline. The total project cost is estimated at $5,080,000. There would be no operational costs as treatment would not be required. However, the project life is zero as the town's water demands will probably reach the safe yield by the time construction would be completed.

12. Raise Upper Root Reservoir

This project is essentially identical to raising the Lower Root Reservoir except that the Upper Reservoir would be raised and the Lower Reservoir would remain intact. The estimated project cost is $4,135,000 with no operational cost and no project life.

13. Lenox Mountain Brook

This project involves the construction of a dam and reservoir on Lenox Mountain Brook in the town of Richmond. The reservoir site is located about 1 mile downstream of the Root Reservoirs. In addition to constructing a dam and reservoir, a 2 MGD water treatment plant and 18,500 feet of 12-inch pipeline would be required. This project would have a zero life expectancy as its safe yield is only 0.32 MGD. The land acquisition for the Lenox Mountain Brook project is estimated at 52 acres.

14. Schweitzer Wells (No Treatment)

This project involves purchasing 0.5 MGD from the Schweitzer Paper Company. Under this scheme, treatment would not be required except for chlorination. Two pumping stations and 15,000 feet of 12-inch pipeline would be required. The total project cost is estimated at $1,063,000 with a yearly operational cost of $17,000. The projected project life is 10 years and land acquisition would be approximately 2 acres. Water samples collected in March and August of 1977 reveal the presence of PCBs (polychlorinated biphenyls). According to the Massachusetts Department of Environmental Quality Engineering, the presence of PCBs in Schweitzer's wells rules out their use as a municipal water supply. This will be confirmed in writing by the state.

15. Schweitzer Wells (Conventional Treatment)

This project is essentially identical to the project just discussed except that the water would receive conventional treatment prior to being pumped into the distribution system. The project cost is estimated at $1,845,000 and the yearly operational cost would be $37,000. Again, the project life would be 10 years. Also, PCBs would still exist. Therefore, this water source can't be used as a municipal water supply.

Recommendations[1/]

It is Whitman & Howard's recommendation that the town of Lenox proceed with the Pleasant Valley alternative. All other options presented herein have drawbacks in one form or another that clearly reveal, from an engineering viewpoint, that Pleasant Valley is the best source of additional water for the town. However, land acquisition costs and/or possible litigations may be such that another alternative would be more advantageous. Lenox's current consultants J. F. Moynihan and Associates, Inc. have recommended the Washington Mountain Brook project to the town and have identified Pleasant Valley and Vahle site as the next most feasible alternative

1/ SCS comment - These recommendations preceded (9/77) the Washington Mountain Brook Watershed project, as presently planned, and therefore were not considered as options.

The Lenox Mountain Brook project, raising the Lower Root Reservoir and raising the Upper Root Reservoir, all provide little additional supply such that they may be undersized by the time construction would be completed. The Foess Wells and the Schweitzer Wells have been eliminated by the Massachusetts Department of Environmental Quality Engineering. The rock wells are highly questionable with respect to quantity and treatment costs would be excessively high. Felton Lake with Site 3 and the ravine above Woolsey Reservoir both have high construction costs. The Vahle Land project inundates three homes on Mountain Road and the Fairfield Brook project would inundate three homes on Swamp Road. The Geller land project costs are close to the Pleasant Valley project costs but require purchasing approximately 83 acres of land in the city of Pittsfield. For the town of Lenox to purchase land in any community, Lenox must first obtain approval of the voters at town meeting and this approval must also be obtained in the town or city in which the parcel of land lies. With both communities consenting, the Massachusetts Legislature must also ratify the land purchase. Approval from a surrounding community is highly suspect considering the growing need for additional water in almost every town and city. Therefore, we believe Pleasant Valley to be the most favorable additional water supply available to the town of Lenox.

1980 COST UPDATE

	Alternative	Cost of Project[1/]	Maintenance
1.	Pleasant Valley Reservoir	$4,668,000.00	$75,900.00/yr
2.	Geller Land Reservoir	5,083,000.00	60,690.00/yr
3.	Vahle Land Reservoir	4,446,000.00	78,900.00/yr
4.	Washington Mountain Brook Project	960,500.00	0
5.	Fairfield Brook	4,699,000.00	49,000.00/yr
6.	Felton Lake	7,479,000.00	43,100.00/yr
7.	Rock Wells (Lime-Soda Ash Treatment)	3,300,000.00	91,000.00/yr
8.	Rock Wells (Ion exchange Treatment)	2,857,000.00	49,000.00/yr
9.	Foess Well (Lime Soda Ash Treatment)	2,509,000.00	87,500.00/yr
10.	Foess Well (Ion exchange Treatment)	2,070,000.00	45,000.00/yr
11.	Raise Lower Root Reservoir	5,924,000.00	0
12.	Schweitzer Wells (Conventional Treatment	2,151,000.00	43,100.00/yr
13.	Schweitzer Wells (No Treatment)	1,240,000.00	19,800.00/yr

1/ Updated using ENR index. Does not include land costs.

Town of Lee, Massachusetts

The following data for water supply alternatives were provided by the town of Lee through their consulting firm of Tighe and Bond, Inc.

The data developed is preliminary and assumptions were made regarding the quality of surface water sources and the quantity of ground water sources. Therefore, equipment and treatment costs have been developed accordingly. Land requirements for each alternative have been considered and are included in the construction costs.

Facilities and construction required by the town of Lenox to utilize up to 0.75 million gallons daily (mgd) from each of the following alternatives is the same. These include: 17,200 feet of 12 inch pipeline; a pressure reducing valve chamber; and two, 2 mgd booster pumping stations. These items represent a construction cost of $1,351,000 and an annual operation and maintenance cost of about $9,800.

The ground water aquifers are shown on Figure 26 (page 85). The surface water sites are identified by a three digit number which appeared in a 1969 report entitled "A Study of Potential Reservoir Sites, Housatonic Study Area, Massachusetts."[1/]

1. This project is development of ground water well(s) in the Woods Pond aquifer, with treatment for hardness. A treatment plant for the existing surface water supply would also be provided. Additional construction includes 10,000 feet of piping and two storage tanks. To provide an additional 1.7 million gallons daily (mgd) for the town of Lee the initial cost would be $3,276,000. The total annual operation and maintenance cost would be about $184,000. To supply Lenox, 2,000 feet of additional piping and a large storage tank would be required. To provide 2.45 mgd, annual construction costs would be $5,492,800. The total annual operation and maintenance would be about $231,800. This source is presently not a viable alternative due to the presence of PCBs found in existing wells in the aquifer.

2. This project is development of ground water well(s) in the Greenwater Brook aquifer, with treatment for hardness. A treatment plant for the existing surface water supply would also be provided. Additional construction of 28,000 feet of pipelines and two storage tanks are included. To provide 1.7 mgd for Lee would require an initial construction cost of $4,024,800 and annual operation costs of about $197,000. Servicing Lenox would require an additional 4,000 feet of pipeline and enlargement of one storage tank. To provide 2.45 mgd for Lee and Lenox would require an initial cost of $6,387,200 and an annual operation and maintenance cost of about $253,800. The safe yield of this development has been assumed.

1/ U.S. Department of Agriculture, Soil Conservation Service, A Study of Potential Reservoir Sites, Housatonic Study Area, Massachusetts, Amherst, Massachusetts, June 1969.

3. This project is development of surface water sites in the Washington Mountain Brook Watershed. The site designations are 702 and 703 or the location of Schoolhouse Lake and October Mountain Lake sites, respectively. Storage at both locations would provide a combined safe yield of up to 2.45 mgd. In addition to the reservoirs (2), a treatment plant, 15,000 feet of 16 inch piping and two 1-MG storage tanks are included. The treatment plant would process water from the existing source in addition to the new source. The initial construction cost to provide 1.7 mgd is $4,739,920, while the annual operation and maintenance cost is about $95,500. To provide 2.45 mgd for Lee and Lenox would require an additional 10,000 feet of 12 inch pipelines and an increased storage of 1 MG at an initial cost of $7,434,120, with an annual operation and maintenance cost of about $117,300.

4. This project is development of a surface water site on Lily Brook, east of Stockbridge Bowl, in Stockbridge, Massachusetts. The site designation is 606. Construction of the following would be required: dam and reservoir, booster pumping station, two water treatment plants, 18,000 feet of pipelines and two 1 MG storage tanks. The new and existing source would be treated separately. The site has the capability of providing up to 2.5 mgd. To provide Lee with 1.7 mgd would cost $4,940,000 for initial construction and about $128,000 annually for operation and maintenance. To provide 2.45 mgd for Lee and Lenox would require an additional 4,000 feet of 12 inch pipelines and a 1-MG increase in storage tank capacity, at a total cost of $7,333,600 initially, and about $158,800 annually for operation and maintenance.

5. This project would require development of a surface water site (#621) on Basin Pond Brook, in Lee. The site has the potential to provide a safe yield of 2.45 mgd. Required construction includes: dam and reservoir, two treatment plants (for new and existing supplies), 18,000 feet of piping, and two 1-MG storage tanks. To provide 1.7 mgd for Lee the construction costs would be $6,297,200 and the annual operation and maintenance costs about $105,000. Development of a 2.45 mgd supply would require 4,000 feet of additional piping and a 1-MG increase in storage tank capacity, at a total initial cost of $8,690,800 with annual operation and maintenance costs of about $126,800.

6. This project is development of surface water site #802 on Hop Brook in Tyringham, Massachusetts. Construction includes: dam and reservoir, booster pump station, two water treatment plants (for new and existing supplies), 32,000 feet of 18 inch pipelines, and two 1-MG storage tanks. Land requirements for this development are significant. To provide 1.7 mgd for Lee would cost $6,589,700 for construction and about $124,500 annually for operation and maintenance. To supply Lee and Lenox (2.45 mgd), 4,000 feet of additional piping and a 1-MG increase in storage tank capacity are required. Construction would amount to $8,983,300, with an annual operation and maintenance cost of about $162, 800.

7. This project is development of surface water site 908 on West Brook in Great Barrington, Massachusetts. Required construction includes: dam and reservoir, two treatment plants (for new and existing supplies),

30,000 feet of 16 inch pipelines and two 1-MG storage tanks. To provide 1.7 mgd for Lee would cost $6,756,100 in initial construction and about $107,000 annually for operation and maintenance. To provide 2.45 mgd for Lee and Lenox would require 4,000 feet of additional pipelines and a 1-MG increase in storage tank capacity, at a total initial cost of $9,149,700 for construction, and about $126,300 for annual operation and maintenance.

The table on page E-9 summarizes the construction and annual costs for each project, using 1980 estimates and an interest rate of 7 1/8 percent. A comparative cost for each project has also been developed to determine which alternative is the least costly for the town of Lee to develop.

Recommendations

Tighe and Bond, Inc. recommends that the town of Lee continue to support the Washington Mountain Brook Watershed project in order to eventually develop that project as a water supply source. The reasons are two-fold. The project is economically beneficial and the environmental impacts are minimal.

PRELIMINARY COST ESTIMATE SUMMARY FOR WATER SUPPLY ALTERNATIVES
LEE, MASSACHUSETTS

PROJECT	COST FOR LEE DEVELOPMENT[1/]			COST FOR LEE-LENOX DEVELOPMENT[2/]		
	CONSTRUCTION	ANNUAL O&M	COMPARATIVE COST[3/]	CONSTRUCTION[6/]	ANNUAL O&M	COMPARATIVE COST[3/]
1. Ground Water Wells Woods Pond Aquifer	$5,358,800[4/]	$423,000	$11,289,600	$8,484,200[5/]	$492,000	$15,382,400
2. Ground Water Wells Greenwater Brook Aquifer	4,692,900	258,000	8,309,300	6,832,700	322,000	11,347,400
3. Sites 702 and 703 Washington Mountain Brook	5,526,700	121,000	7,223,200	8,001,900	151,000	10,118,900
4. Site 606 Lily Brook	5,760,000	167,000	8,101,400	7,936,200	197,000	10,698,300
5. Site 621 Basin Pond Brook	7,342,500	131,000	9,179,200	9,518,700	146,000	11,565,700
6. Site 802 Hop Brook	7,683,600	171,000	10,081,100	9,859,700	204,000	12,719,900
7. Site 908 West Brook	7,877,600	131,000	9,714,300	10,053,700	146,000	12,100,700

1/ Based on Safe Yield of 1.7 million gallons daily.
2/ Based on Safe Yield of 2.45 million gallons daily.
3/ Comparative Cost is sum of Construction Cost and Annual O&M Cost capitalized at 7 1/8 percent.
4/ Includes $1,539,000 for PCB treatment costs.
5/ Includes $2,079,600 for PCB treatment costs.
6/ Includes $960,500 for Lenox pipeline construction.

APPENDIX F

LETTERS OF COMMENT RECEIVED ON DRAFT ENVIRONMENTAL IMPACT STATEMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I

J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

November 3, 1980

Mr. Sherman L. Lewis, State Conservationist
Soil Conservation Service
451 West Street
Amherst, MA 01002

RE: D-SCS-B36020-MA

Dear Mr. Lewis:

In accordance with Section 309 of the Clean Air Act and the National Environmental Policy Act, we have reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Washington Mountain Brook Watershed Project in Berkshire County, Massachusetts.

According to the DEIS, this project has as its goals flood prevention, streambank stabilization and sediment control, recreation and municipal water supply. Initially authorized in 1969 and supplemented in 1980, the plan includes one multiple-purpose flood control and recreation structure (Washington Mountain Lake); one multiple-purpose flood control, water supply and recreation structure (October Mountain Lake); one multiple-purpose flood control and water supply structure (Schoolhouse Lake); channel work; and conservation land treatment. Washington Mountain dam was constructed in 1973 but has no permanent impoundment yet because of land rights considerations. The remainder of the authorized project has not yet been constructed.

From the standpoint of EPA's areas of jurisdiction and expertise, we have strong environmental reservations about this project. In addition, we believe the DEIS does not provide sufficient information on the project's costs, both environmental and financial, as required by the National Environmental Policy Act and Section 404(b) of the Clean Water Act. The fundamental reason for our concern is the fact that the project will cause significant environmental impact while the DEIS does not present a convincing argument that its benefits outweighs its costs.

Our detailed comments follow.

Impacts on Water Resources

1. As noted in the DEIS, the project will require a permit under Section 404 of the Clean Water Act, thereby requiring application of EPA's Section 404(b)(1) Guidelines. These Guidelines, as you know, focus on the effects of placing dredged or fill material in the waters of the United States. Of particular concern with the Washington Mountain Brook Watershed Project are its effects on drinking water supplies and the aquatic ecosystem during both construction and operation. We believe it would be appropriate for the EIS to include a 404 Evaluation using the applicable sections of the Guidelines.

2. During construction, the project will cause a significant amount of sedimentation in Washington Mountain Brook and its tributaries. This will result from clearing of reservoir areas, extensive earthmoving associated with dam and road construction, and activity in borrow areas. This sedimentation and turbidity, which the DEIS describes as temporary, will last for the entire construction period and probably for a considerable period of time after construction. We are particularly concerned about sedimentation because of the Brook's current use as a drinking water supply and because of the project's use after completion as a water supply, and the fact that a filtration plant does not now exist and is not planned, according to the DEIS. Turbidity can prevent chlorination from providing an adequate degree of protection of public health. The DEIS seriously underestimates this impact. In order for the EIS to accurately portray impacts, the following information must be provided: the duration of the construction period; the approximate maximum amount of exposed soils at any given time; the anticipated amount of rainfall, based on historical records, during construction periods; and the impacts on drinking water quality of runoff during a worst case rainstorm (during construction and initial years of operation). Based on the data now in the DEIS, proposed mitigation measures for sedimentation may not be adequate to protect water quality and public health. Depending on the information developed, extraordinary sediment control measures, beyond those described in the DEIS, may be necessary.

3. The ability of the proposed project to provide high quality drinking water is uncertain in our view, given the fact that the October Mountain Lake is also to serve as a recreation pool.

We believe that there may be a fundamental incompatibility of uses planned for October Mountain Lake. As the DEIS points out, the public is excluded from Finerty Pond, now a supplemental source of drinking water for Lee, and "fishing is not permitted in an attempt to protect the emergency water supply source" (p. 35). Elsewhere in New England, there are examples of public access being prohibited on watersheds of drinking water reservoirs in order to preserve the quality of the supplies. The DEIS points out that how the reservoirs will be managed is yet to be determined.

According to the DEIS, only fishing recreation is claimed as an initial benefit (although whether motor-powered boats are assumed is unknown). The DEIS also states, however, that the reservoirs in the future may support far more extensive recreational use including several hundred camp sites, parking lots and sanitary facilities . The DEIS's prediction of water quality (Appendix D) concludes that the lakes will be "marginally oligothropic" (p. D-7) but seems to warn against increased human activity due to the associated effects on the quality of the lakes (p.D-8).

In any event, some degree of degradation will occur if recreation is permitted and, the extent of degradation will depend on the uses allowed. As the EIS points out, recreational use may introduce pollutants such as petroleum derivatives, heavy metals, coliform bacteria and solid refuse. If the ultimate

recreation plan, referred to in the EIS, is implemented, runoff from the parking areas and sanitary facilities could signficantly affect the trophic status of October Mountain Lake (p. 92).

We believe the specific initial and ultimate uses of the reservoirs and their watersheds, and the issue of incompatibility of uses, should be addressed in the EIS in order to allow a decision at this time on whether to proceed with the project.

4. The project will result in the permanent loss, through inundation, of 25% of the wetlands in the watershed, approximately 7,000 feet of high quality perennial and intermittent streams which provide habitat for a cold water fishery, and 129 acres of forest land. Mitigation measures, which would lessen or compensate for the loss of these resources and their associated habitats, should be provided. Also, the value of wetlands as floodwater retention areas should be given consideration.

Benefit/Cost Analysis

1. A basic premise of EPA's Section 404(b)(1) Guidelines is that a project resulting in a significant alteration of a high quality aquatic ecosystem must be clearly shown to be necessary. We believe that such an alteration is inconsistent with Section 404(b)(1) Guidelines and therefore, should not occur unless or until the need and benefits of the alteration can be thoroughly and convincingly documented and shown to outweigh the costs. In our view, the DEIS does not include the necessary information in this regard, and in particular, seems to underestimate the costs.

2. The benefit/cost analysis appears to be seriously flawed in several respects. First, in using a 3 1/4% interest rate, the true cost of the project is not shown. While 3 1/4% is the interest rate required by SCS policy (according to footnote #1, page A-1) for internal project planning purposes, it by no means is the only interest rate that can be used in presenting project costs in the EIS. This is a critical point because the true cost of money today is far in excess of 3 1/4%. According to the Federal Reserve Bank of Boston, the federal government on October 30, 1980, was obligated to pay 12.3% interest on federal reserve bonds. Because NEPA requires a full disclosure of true costs, we request that the benefit/cost analysis be recomputed using a current interest rate and that this analysis be presented in the EIS in addition to the one using 3 1/4%.

A second major flaw in the benefit/cost analysis is the omission of the cost of constructing Washington Mountain Dam. The reason presented in the DEIS is that the dam was built seven years ago. Nevertheless, the analysis shows that recreation benefits are claimed for the dam. Since the Washington Mountain Dam is consistently described as a fundamental part of the authorized watershed project, whose benefits will not be fully realized until completion of the entire project, its costs, and benefits, must be presented. Without this information, the true costs of the total project are not being disclosed.

A third critical omission in the benefit/cost analysis is the initial cost and annual operation and maintenance costs of a 3.2 million gallons a day water treatment plant, 6,000 feet of pipeline, and two storage tanks. On page 12, the DEIS indicates that these facilities may be added as a second phase of the project, and are therefore included for discussion purposes. The table on page 18 shows the costs of these facilities as $4,492,300, which is in excess of the cost attributed to the entire phase 1 project, $3,431,900. Given the plan for a significant amount of recreational use of the lakes, it is highly likely that the treatment facilities will be determined to be necessary. Therefore, their costs should be included in the analysis.

3. The water supply reservoirs will be operated under state water supply regulations. Many existing reservoirs in Massachusetts preclude public access for recreation. Public access to the proposed reservoirs may become restricted or prohibited at these locations. Since recreational benefits are claimed for these reservoirs and this would alter benefit/cost analysis considerably, further consideration should be given to this possibility.

4. With regard to the permanent wetland losses associated with this project, we refer you to "Freshwater Wetlands, Their Nature and Importance to Man" by Norton H. Nickerson, Biology Department, Tufts University, Medford, MA 02155, and "An Economic Analysis of Wetland Protection" by Francis R. Thibodeau and Bart D. Ostro, Department of Biology and Department of Economics, Tufts University, Medford, MA 02155. They may be of use in your benefit/cost analysis.

Alternatives

We believe that the DEIS's analysis of alternatives should address in more detail the environmental consequences of alternatives to the proposed action, and mitigation measures to reduce adverse impacts. We also believe the following additional alternatives should be given more thorough consideration:

1. water conservation (in accordance with the President's Water Policy message of June 6, 1978).

2. prohibiting development and filling in the floodplain.

3. restriction of flood path, especially away from roadways.

4. flood proofing or relocation of homes and trailers, relocation of roads and reconstruction of bridges to eliminate constriction (we believe this alternative should be given particular attention because, according to the EIS, flood damages to residential property amount to only $2,240 annually as compared with $53,310 of damage to roads and bridges).

In summary, we believe that the true costs of the Washington Mountain Brook Watershed have not been fully disclosed in the EIS. The difficulties of assigning a dollar value to environmental losses make it critical for the benefit/cost analysis to accurately portray all of the financial costs associated with the total project. We believe that the environmental resources at stake in this project warrant this disclosure, and that NEPA requires it.

Finally, we would add that we regret not having been invited to review and comment on the State environmental impact report or to participate in scoping sessions, if they were held. Many of our concerns could perhaps have been resolved at that stage or addressed in the DEIS.

In accordance with our national rating system (see enclosed explanation), we have rated the project and EIS as ER-3. If you wish to discuss these comments or have questions, please contact Elizabeth Higgins of my staff.

Sincerely,

Richard R. Keppler

Richard R. Keppler, Acting Director
Environmental Impact Office

Enclosure

EXPLANATION OF EPA RATING

Environmental Impact of the Action

LO -- Lack of Objections

EPA has no objections to the proposed action as described in the draft environmental impact statement; or suggests only minor changes in the proposed action.

ER -- Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating federal agency to reassess these aspects.

EU -- Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1 -- Adequate

The draft environmental impact statement sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 -- Insufficient Information

EPA believes that the draft environmental impact statement does not contain sufficient information to assess fully, the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft environmental impact statement.

Category 3 -- Inadequate

EPA believes that the draft environmental impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft environmental impact statement is assigned a Category 3, no rating will be made of the project or action; since a basis does not generally exist on which to make such a determination.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-80/1025

NOV 24 1980

Mr. Sherman L. Lewis
State Conservationist
Soil Conservation Service
Department of Agriculture
451 West Street
Amherst, MA 01002

Dear Mr. Lewis:

We have reviewed the draft environmental statement for the Washington Mountain Brook Watershed, Berkshire County, Massachusetts, and conclude that several areas of discussion merit reexamination. Furthermore, we believe the statement omits information essential for a clear understanding of impacts and has not addressed mitigation alternatives. Without mitigation, we oppose the project.

Fish and Wildlife Resources

We feel this statement is deficient in addressing the impacts to fish and wildlife resources. Approximately 353 acres of open water, 30 acres of grassland and 8 acres of rock riprap will replace 129 acres of forest land, 65 acres of wetland, 4 acres of borrow area, and 193 acres of cleared forst land. The 65 acres of wetlands represents 25 percent of the wetlands in the Washington Mountain Brook Watershed. There will be a loss of 5,400 feet of perennial stream and about 1,500 feet of intermittent stream. The DEIS does not consider mitigation measures for the impacts to fish and wildlife resources due to project installation.

We consider the planned flow releases inadequate to sustain indigenous aquatic organisms during times of the year critical to their survival and maintenance. Inadequate flows are particularly true for October Mountain and Schoolhouse Lakes. We recommend Aquatic Base Flows (ABFs) of 4.0, 0.5, and 1.0 cubic feet per second per square mile of drainage area (cfsm) for the spring, summer, and fall critical periods, respectively. Alternately, minimum releases of median monthly flows would be adequate. Furthermore, when inflows immediately upstream of the project fall below the ABFs, outflows from the project should equal the inflows.

The DEIS states that the watershed areas and reservoirs of October Mountain and Schoolhouse Lakes, which are totally within the October Mountain State Forest, will be managed according to appropriate health regulations for surface water supplies. In the New England

States, this often means eliminating public access to water supply reservoirs. Schoolhouse Lake has no recreational development planned, and we assume that the public will be denied access. October Mountain Lake is being planned with 502 acre-feet of storage for recreation, primarily fishing. Water for the Town of Lee would normally be withdrawn from October Mountain Lake from December through April. However, the management of October Mountain Lake will be changed to allow year-round use of the water supply storage when warranted by the need for additional yield. We are concerned that the public will eventually be denied access to this lake. We must question the Federal policy which permits Federal funding of such projects if the public is denied access to the reservoirs.

The statement does not discuss the proposed project and alternatives with respect to Executive Orders 11988 and 11990 on Floodplain Management and Protection of Wetlands, which state that direct or indirect support of floodplain development or new construction in wetlands should be avoided wherever there is a practical alternative In addition, Executive Order 11988 encourages the restoration and preservation of natural and beneficial floodplain values. Completion of the planned project will reduce the area subject to flooding from a 100-year flood from about 40 acres to 12 acres. This could lead to increased development in the lower reaches of the floodplain The project will destroy 25 percent of the wetlands in the Washingto Mountain Brook Watershed.

The President's Water Policy Message of June 6, 1978, states that water conservation is a national priority. The effects of water conservation are not critically analyzed in this statement. The Town of Lee presently utilizes the flat rate billing method for water charges. Water conservation measures could eliminate the need for the water supply reservoirs. With water conservation, groundwater development may be sufficient to satisfy the water supply needs of the Towns of Lee and Lenox. We believe the report should be expanded to discuss this feature as a possible alternative to the proposed action as well as the finding which would govern support or opposition to the alternative.

Cultural Resources

As stated in the condensed report of the historical and archeological survey, an objective of the survey was to locate prehistoric and historic sites of archeological significance. Standing buildings and structures of historic, architectural or engineering significance were not included in the report. These cultural resources must be considered in addition to those archeological sites discovered during the survey.

Measures designed to prevent looting of cultural resources in the project area should be developed in coordination with the State Historic Preservation Officer (SHPO). This is especially important since sites may be subjected "...to increased vandalism as a result of project induced use of the watershed" as noted on page 102.

Preservation in situ is generally preferable to salvage excavation. For this reason, avoidance of significant archeological sites should be considered.

Results of studies to determine the eligibility of the agricultural village for the National Register should be included in the final environmental statement.

A letter from the SHPO stating results of consultation and compliance should also be included in the final statement.

Concluding Comment

The DEIS does not adequately address the impacts to fish and wildlife resources and the mitigation of these impacts. Planning of this project appears to be contrary to Executive Orders 11988 and 11990 and the President's Water Policy Message of June 6, 1978. Prior to the filing of the final environmental statement the issues cited above should be resolved.

Sincerely,

James H. Rathlesberger
Special Assistant to
Assistant SECRETARY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:

NEDPL-I

4 November 1980

Mr. Sherman L. Lewis
State Conservationist
USDA, Soil Conservation Service
451 West Street
Amherst, Massachusetts 01002

Dear Mr. Lewis:

We have reviewed the Draft Environmental Impact Statement (EIS) for Washington Mountain Brook Watershed, Berkshire County, Massachusetts.

Under Section 404 of the Clean Water Act, a permit from the Corps of Engineers will be required for the construction of the impoundment structures, sedimentation basins, and other activity involving the placement of fill material in Washington Mountain Brook and its adjacent wetlands. Discharges associated with the construction of the proposed water supply pipeline may already be permitted under a nationwide permit which authorizes certain discharges without specific application to the Corps for the proposed activity. For a full explanation and specific details on the nationwide permit, please refer to the July 19, 1977, Part II Federal Register on the Regulatory Program of the Corps of Engineers, Section 323.4.

The Town of Lee has been informed of the necessity to apply for permits by a separate letter from our Regulatory Branch dated October 27, 1980. We mention the required permits here because the final EIS should discuss these permits and the Corps of Engineers responsibilities and jurisdiction.

We must review the project, its impacts, its costs and benefits, and all reasonable alternatives to the project as a part of the public interest review undertaken to determine whether or not to issue a Section 404 permit. Unresolved issues, inconsistencies, and omitted discussions in the draft EIS make it difficult to determine whether all of the reasonable alternatives and their impacts have been examined and whether the costs for all alternatives have been analyzed in a consistent manner. We feel that correction of the problems discussed below will result in a final EIS that will better assist us in our future permit determinations.

NEDPL-I
Mr. Sherman L. Lewis

4 November 1980

A brief explanation of the provisions of PL-83-566 would be helpful, especially as they relate to: (1) project authorization (2) the necessity of completely fulfilling multipurpose objectives, and (3) cost-sharing of the project. An estimate of how the cost-sharing burden might affect an average "user" of the project would assist us in our public review. Also, what is the relationship of this type of water resources project to the requirements of the Principles and Standards of the Water Resources Council?

Analysis of the cost-benefit breakdowns show that several alternatives would be cost-effective for the single purpose of flood control or for dual purposes of flood control and recreation, but lose their cost-effectiveness when the elements to fulfill the third purpose of water supply are added. For example, the negative net cost-benefit of the groundwater supply component used in Alternatives I, II, IV, and V caused or was the greatest contributing factor to the negative monetary balance of those alternatives. Perhaps if a more cost-effective water supply element could be found, an alternative combining single purpose elements could be formulated which would meet all the goals as cost-effectively as the alternatives utilizing multipurpose elements.

It was difficult to tell from the presentation which water supply options were technically feasible and which were cost-effective. A discussion should be presented which clearly shows which water supply options are practicable and could be used in combination with various flood control and recreation options to satisfy your objectives.

The surface water options listed in Appendix E should be considered as single-purpose water supply elements. Presumably these were not considered because of their expense, but their higher cost seems to be largely due to the inclusion of water treatment plants and the use of different capitalization factors. These options should be analyzed for costs and benefits using the same methods and assumptions used for the multipurpose project components to see if they are competitive single-purpose elements.

In conjunction with the examination of single-purpose surface water supply options, the uncertainties regarding the ground water supply options should be resolved. The acceptability of the water quality in each aquifer should be positively confirmed or denied, and the yield of the Greenwater Brook Aquifer should be positively established. This analysis should explain or resolve the yield and cost discrepancies between the Greenwater Brook Aquifer development described in the text (page 104) and that described in Appendix E.

NEDPL-I 4 November 1980
Mr. Sherman L. Lewis

The final EIS should address the anticipated impacts of the project on downstream water quality and flow regime. The State water quality classifications for the stream segments involved should be given and compared to existing and projected water quality parameters.

The text indicates that the water supply line associated with the project will closely parallel the stream for 2.2 miles and cause adverse sedimentation effects. The final EIS should explore alternative alignments and mitigation measures for this portion of the project.

What is the basis for expecting an enhancement of furbearer trapping when stream habitat is replaced with lake habitat? If this is based on expected population increases, some supporting documentation should be presented.

The final document should contain evidence of appropriate coordination with the U.S. Fish and Wildlife Service, as required by the Fish and Wildlife Coordination Act, and a discussion of the proposed alternative's compliance with Executive Order 11990 regarding the protection of wetlands.

The draft document mentions that public controversy developed which led to the development of a state-level environmental impact report and later, to an EIS. A brief discussion of the issues should be presented.

Thank you for this opportunity to comment. If you have any questions or wish further assistance, please contact Ms. Beth Henderson of my staff at 617-894-2400, extension 234.

Sincerely,

Gard D. Blodgett
for JOSEPH L. IGNAZIO
Chief, Planning Division

NEDPL-I 4 November 1980
Mr. Sherman L. Lewis

Due to the small number of residences (14) within the 100 year flood zone and the relatively low value of the 10 of these residences which are mobile homes, a flood proofing and relocation alternative would seem promising. However, Alternative V, the flood proofing and relocation alternative, was not found to be cost-effective. Three factors contributed to this: benefits could not be claimed for sediment prevention, benefits could not be claimed for road flood damage prevention, and the groundwater water supply component contributed a large cost-benefit deficit to the project. We suggest that the alternative be reformulated by adding sediment traps similar to those of the proposed project and other improvements to increase the sediment removal benefits, by using a more cost-effective water supply component (if one is available), and by considering whether all roads are really necessary (now and after relocation) and whether some roads could be realigned to avoid damages, thereby increasing road damage flood protection benefits. Other alternatives could be similarly reformulated in an attempt to improve their overall cost-benefit picture.

The cost-benefit analyses presented for the project alternatives (except for Alternative III-error?) assume no water treatment plants will be constructed even though the text (page 87) indicates that treatment may be necessary. Page 18 shows that the cost of such facilities could be greater than the cost of the project itself, and it is not clear who would bear the burden of the treatment costs. Because of the potentially great cost-benefit and socio-economic impacts of providing future treatment, the necessity and degree of treatment for each water source is a critical issue which should be resolved and fully accounted for in the final EIS's comparative analysis.

Since the validity of claiming both recreation and water supply benefits for a single impoundment depends on State and local policies regarding public access to surface water supplies, these policies should be discussed in the final EIS and dual benefits claimed only if access is allowed. The draft document indicates that the public is presently excluded from the local water supply pond.

On page A-1, the annual costs and annual benefits of the water supply facilities equal each other. How were these figures derived?

The harvesting of timber on the sites in 1976 in anticipation of this construction does not comply with the CEQ regulations regarding limitations on actions during the NEPA process (CFR 40 Section 1506.1). In order to prevent this action from limiting or influencing the choice of alternatives, the value of the harvested timber should not have been deducted from the land rights cost as it was in the draft EIS (page A-3). In addition to correcting this, the "Short-Term vs Long-Term Use of Resources" section should address this loss of renewable resources.

BERKSHIRE COUNTY REGIONAL PLANNING COMMISSION

10 FENN STREET, PITTSFIELD, MASSACHUSETTS 01201

TELEPHONE (413) 442-1521

MARY ELLEN AUSMAN, Chairman
GEORGE OSGOOD, Vice-Chairman
JAMES BURNS, Clerk
RALPH D'ELIA, Treasurer
ROGER SOULIERE, Member-At-Large
PHILIP C. AHERN, Honorary Chairman

KARL HEKLER, A.I.C.
Director

November 4, 1980

Mr. Sherman L. Lewis
State Conservationist
Soil Conservation Service
451 West Street
Amherst, Massachusetts 01002

Dear Mr. Lewis:

After careful review of the draft Environmental Impact Statement for Washington Mountain Brook Watershed (June 1980), the Berkshire County Regional Planning Commission submits the following comments in support of the proposed project (Alternative VI).

1. The public water supply capacity from the three surface impoundments will provide the Town of Lee with needed supplies. Additionally, the project's capacity to supply water to the Town of Lenox is an important and beneficial aspect. However, it is hoped that arrangements between Lee and Lenox will be finalized so as to assure that Lenox will receive the water they desperately need. BCRPC continues to encourage Lenox to co-sponsor the WMB project in order to assure access to the project's water supply. In 1980, BCRPC endorsed the WMB project in the study, Water Supply and Sewerage - Berkshire County, Massachusetts, as a public water supply source for Lee and Lenox. Presently, ten years later, the WMB project's water supply benefits are in even greater need.

   It is quite possible that the WMB project's estimated average annual water supply benefit of $114,600 (1979) is a conservative figure. Unfortunately, the EIS gives little explanation of how that figure was calculated, but given the importance of public water supply for fire protection; health; residential, industrial and commercial development; recreation; and aesthetics the value of the water supply benefits could be justifiably estimated at significantly more that the listed figure. That would increase the net project benefits . Furthermore, if Lenox is to receive water from WMB, then the benefits to Lenox will be substantial, a dollar figure that could be added to the project's net benefits.

2. The recreational opportunities which will be provided by the WMB project will make a positive contribution to the recreation base of Berkshire County. Given the eutrophication problems of many of the County's lakes, the lake recreation opportunities planned for October Mountain and Washington Mountain lakes will help replace the opportunities impaired by rampant weed growth in the older lakes.

3. The flood control component of the project for the areas along Washington Mountain Brook should protect the Town of Lee from the degree of flood damage it has experienced in the past.

We hope that construction of the WMB project can be started in 1981, and we will continue to support efforts to make this project a reality.

Sincerely,

Karl Hekler

Karl Hekler
Director

KH/bv

BERKSHIRE COUNTY REGIONAL PLANNING COMMISSION

10 FENN STREET, PITTSFIELD, MASSACHUSETTS 01201

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RALPH D'ELIA, Treasurer
ROGER SOULIERE, Member-At-Large
PHILIP C. AHERN, Honorary Chairman

KARL HEKLER, A.I.C.P
Director

November 25, 1980

Mr. Sherman Lewis
State Conservationist
Soil Conservation Service
451 West Street
Amherst, Massachusetts 01002

RE: Washington Mountain Brook Project EIS, June 1980

Dear Mr. Lewis:

We are writing this letter in response to questions which have apparently arisen over population projections for the region and its 32 municipalities, and how they relate to SCS's Washington Mountain Brook Project EIS.

In 1976 the BCRPC, and the other regional commissions in the state, entered into an agreement with the then Office of State Planning to develop standardized population projections for the state and its communities. The purpose of the program was to establish a consistent and objective demographic data base which could be utilized in the development and evaluation of all sorts of local, state and federal projects. The resultant figures have been utilized by numerous agencies, obviated the need to spend time and money to prepare new population projections for each new project, provided an objective basis upon which to evaluate future needs for services and facilities, and reduced the disagreements which frequently arise over the future demand for those services and facilities.

In the past, proponents of various projects sometimes tended to develop "rosy" projections that justified their proposals. When these "rosy" projections were aggregated into regional, state or national totals, the results often exceeded expected growth rates. The OSP/RPA "standardized" projections were specifically developed to control this problem and provide a single objective set of projections. Initially, most state agencies refused to utilize the "standardized" projections; happily, more and more such agencies are now resorting to them, including some state environmental agencies. In fact, the projections were reviewed and certified by the Massachusetts Executive Office of Environmental Affairs and the Department of Environmental Quality Engineering. The Federal government is now following Massachusetts' lead in this and is also developing a "standardized" population projection program.

We would like to commend the Soil Conservation Service for utilizing our standardized population projections in the Washington Mountain Brook Watershed Project EIS.

The key element of the population projections is the "regional control total " developed for each of the state's regions by OSP. OSP then had each regional agency distribute future population into each community on the basis of 20 growth-potential-indicators. The overall effort was led by Al Sanders of OSP, a highly respected demographer.

In Berkshire County, OSP's figures indicated a static population for 1980 and slow growth thereafter to the year 2000. This was based on the assumption that the region's net out-migration would slowly decline and that the increasing number of women of childbearing age would cause a natural increase, even with a low birth rate. OSP projected a 6.4% increase in the region's population, from 148,563 in 1975 to 158,000 in 2000 - a simple growth rate of a quarter of a percent per year.

BCRPC "disaggregated" the regional projection into subregions, and then made town-level projections. OSP accepted and approved BCRPC breakdowns of the regional control total. BCRPC projected Lee as a growing town based on its central location and direct accessibility to the Massachusetts Turnpike. Lenox will grow as a prime residential area. Lee was forecast to have a 25 year population increase of 10.5 percent, or a simple annual rate of four tenths of one percent. Lenox was projected to have a population increase of 19.1 percent, or a simple annual rate of three quarters of one percent. These are not rapid growth rates. The preliminary results of the 1980 Census indicate that the 1980 projection is a little high for Lee and a little low for Lenox --- the two towns were projected to have a population of 12,560, and the actual 1980 preliminary count was 12,791. When BCRPC updates its town-level projections next year, the figures will not change greatly for these two communities.

Not only were the population projections utilized by you realistic and indicative of slow growth, but in Table 16 (Residential column) they apparently do not include seasonal dwellings or seasonal population. Moreover, the number of households in both Lee and Lenox is increasing more rapidly than total population.

It is sad for us to see some individuals carelessly characterize the standardized OSP/RPA projections you used as "unsubstantiated", "inadequate", "incomplete", "old", and "totally hypothetical". As described above, the projections are realistic, indicative of slow grwoth, and are a major advancement over the "project sponsor" projections of the past. Apparently some would like to criticize whichever population figures you use. Frankly, this causes us to question the reasonableness of their motives - especially when BCRPC's projections are described as "at variance" with OSP's when they are in fact the same, and when OSP is described as projecting "virtually no growth" when slow growth is projected for both the region and the Town of Lee.

Lastly, we believe the Soil Conservation Service made a proper conservation of its resources, time and money in not doing extensive work and descriptions

on population, and instead simply utilized the standardized projections. That is what they were prepared for.

Sincerely,

Gaylord Burke

Gaylord Burke
Assistant Director

GB/bv

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

October 29, 1980

Mr. Sherman L. Lewis
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
451 West Street
Amherst, Maine 01002

Dear Mr. Lewis:

We have reviewed the Draft Environmental Impact Statement (EIS) for the Washington Mountain Brook Watershed, Berkshire County, Massachusetts. We are responding on behalf of the U.S. Public Health Service and are offering the following comments for your consideration in preparing the final document.

We understand that the proposal provides for watershed protection, flood prevention, municipal water supply, and recreation. While we have no major objections to the proposed project plans, we have some concern regarding the potential flood control benefits in Lee.

The two proposed permanent sediment control structures in Washington Mountain Brook "... will be designed to trap approximately 7,600 cubic yards of sediment (all material greater than 6 inches in size) during a 100-year flood." Yet, the current estimated volume of deposition for a 100-year flood would be in excess of 26,000 cubic yards. What benefit if any would these two sediment control facilities offer the Town of Lee if a 100-year or greater flood event occurred and more than 18,000 cubic yards of gravel, boulders, etc., were bypassed to the town?

The potential for development in the 36 acres of benefited flood plain should be described. If development was to occur in this area, to what extent would flood damages be aggravated from a storm event greater than 100-years? Examination of Figures 23 and 24 reveals flood damage along a portion of Washington Mountain Road that is outside of the present 100-year flood area (Figure 25 Flood Hazard Map.) Were there other areas in Lee subject to damage outside of the 100-year flood plain? Has any consideration been given to possibly adding a relocation plan of the more flood-prone structures to the preferred plan?

According to Appendix D of the EIS, phosphorus loadings to the proposed lakes should not be increased by land use changes or increased human activity in the watershed above. Recommendations are also made discouraging the installation of septic systems and shoreline development. For these reasons, we believe efforts should be made to develop and implement a water quality management plan to protect the future water quality for Washington Mountain Lake, October Mountain Lake, and Schoolhouse.

We appreciate the opportunity to review this Draft EIS. Please send us one copy of the final document when it becomes available.

Sincerely yours,

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Bureau of State Services

FEDERAL ENERGY REGULATORY COMMISSION

WASHINGTON 20426

In Reply Refer To:

OEPR-DHRA
Cooperative Studies
Draft Environmental Impact
Statement
Washington Mountain Brook
Watershed in Massachusetts

Mr. Sherman L. Lewis
State Conservationist
USDA, Soil Conservation Service
451 West Street
Amherst, Massachusetts 01002

OCT 29 1980

Dear Mr. Lewis:

This is in response to your letter of September 9, 1980, requesting our review and comments on the draft environmental impact statement for the Washington Mountain Brook Watershed in Berkshire County, Massachusetts. The proposed watershed project consists of implementation of conservation land treatment, construction of three multi-purpose reservoirs, and channel work.

We have reviewed the draft report to determine the effects of the proposed project on the Commission's responsibilities under the Federal Power Act, Natural Gas Act, and other authorities. Such responsibilities relate to the licensing of non-Federal hydroelectric power projects, regulation of construction and operation of natural gas pipeline facilities, and participation in the planning of Federal water and power resources projects.

Based on our review, we conclude that the proposed watershed project would not provide opportunity for economical development of hydroelectric power. Further, neither existing hydroelectric development nor sites currently under consideration for potential development would be adversely affected by the proposals. Finally, our review indicates no apparent conflicts with natural gas resources and facilities or hydrocarbon reserves.

Thank you for the opportunity to review this report.

Sincerely,

William W. Lindsay, Director
Office of Electric Power Regulation

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20250

OFFICE OF EQUAL OPPORTUNITY

SEP 25 1980

IN REPLY REFER TO: CRIS - SCS

SUBJECT: Draft Environmental Impact Statement
Washington Mountain Brook - Watershed, Massachusetts

TO:
Sherman L. Lewis
State Conservationist

THROUGH: David Montoya, Director
Equal Opportunity and Civil Rights
Soil Conservation Service

We have reviewed your Draft Statement. There appear to be no direct civil rights implications associated with the project.

We would like to point out for your future reference that SCS General Guidelines for compliance with the National Environmental Policy Act, 7 CFR 650.8 (b)(3) require that these statements . . . "describe the impacts of proposed action on minority groups and low-income persons." This requirement is included so that the impacts of proposed actions will not fall disproportionately or negatively upon minority group persons in or near the affected area. Even if there are no or very few minority group persons affected, it would be helpful if future statements include (1) reference to the minority population, if any, and (2) a specific indication that the agency and the local sponsors have examined the probable impacts of the proposed actions upon the minority population, if any, and indicate what conclusions flow from the examination.

In addition, since there appears to be some minor recreational impact associated with the project, if local recreational facilities are involved, you will want to be sure that they adequately take into consideration the needs of handicapped persons who might use the facilities.

Thank you for the opportunity to review the Draft Statement.

JAMES FRAZIER
Director

Telephone 243-2100

TOWN OF LEE

Office of the Selectmen

LEE, MASSACHUSETTS 01238

November 25, 1980

Mr. Sherman L. Lewis
State Conservationist
Soil Conservation Service
451 West Street
Amherst, Massachusetts 01002

Dear Mr. Lewis:

This letter is being sent as a follow-up on the comments we presented at the Washington Mountain Brook Project Public Meeting in Lee on October 15, 1980.

We have reviewed the Draft EIS and feel that it adequately addresses the project needs for flood control, recreation and water supply. The EIS fully reports the project costs and environmental impacts. Although we have been very concerned about the long delays in carrying out the project, we feel that the recent changes as documented in the Watershed Plan Supplement No. 4 improve the project by providing us the opportunity to offer assistance to Lenox if they cannot identify more feasible ways to meet their chronic water shortages.

We are also encouraged by the assistance we have received from the Massachusetts Department of Environmental Management in reaching the agreements which we have spelled out in our agreement with Commissioner Kendall dated June 30, 1980.

The following suggestions are provided for your use in preparing the final EIS.

1. The EIS, on pages 69-70, discusses the potential for DEM to develop recreation facilities at the October Mountain Lake Site. The Watershed Plan for this project does not include any recreation facilities. We know of no plans by others for the development of recreation facilities at any of the reservoirs in the project. In keeping with the June 30, 1980 agreement with DEM, we request that reference to recreation facilities be removed from the final EIS. Should the need for recreational facilities be identified in the future, we request that they be developed at the Washington Mountain Lake Site. This site is more suitable because of its larger size and minimum water surface fluctuation. This request is in keeping with the water rights provided to Lee by the Commonwealth's Acts of 1897.

2. The EIS, on page 15, discusses the maintenance of the watershed structures. We suggest that you add the following to this section on maintenance. "The town of Lee will be responsible for working with the Department of Environmental Management in developing management plans for all reservoirs to protect water quality and maximize opportunities for multiple-use of the forests."

3. The comprehensive studies which Lee has conducted in exploring solutions to our water supply needs are summarized in Appendix E of the EIS. The town of Lee and some of the industries in Lee have for years searched for feasible sources of ground water. We have known for sometime that the Woods Pond Aquifer, because of its replenishment by the polluted Housatonic River, has the potential for additional yield. We have determined this option to be technically not feasible for the reasons stated in our report. We suggest that this decision be amplified on page E-6. Perhaps statements such as the following could be included. "Woods Pond has the greatest concentration of PCB's identified to date in the Housatonic River. While tests have been inconclusive regarding the presence of PCB's in the river connected aquifer, the town cannot develop this as a source of municipal water. Insufficient knowledge is available on the movement of PCB's in the Woods Pond-Woods Pond Aquifer system or on the potential effects that increased pumping would have on the already heavily pumped aquifer to justify our investment in this alternative. The town does not have the land rights to this aquifer and has no control over its quality. In 1977 the Massachusetts Department of Environmental Quality Engineering stated: "We cannot approve the use of the above noted wells (Schweitzer wells in Woods Pond Aquifer) due to the possibility of the existence of PCB's as shown by previous analyses."

4. The EIS understates the favorable environmental effects on page 101. The development of these reservoirs will greatly enhance the area for wildlife and people. Perhaps the apparent unjustified reduction in property values of the state lands in the town of Washington reflects the need for water resource development to enhance the forest for public use.

We offer our assistance to you in preparing the final EIS and urge you to complete your work as quickly as possible so that we in Berkshire County can realize the projected benefits of this project at the earliest possible date.

Very sincerely yours,

LEE BOARD OF SELECTMEN

John E. DeVarennes
Chairman

UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION
451 West Street
Amherst, MA 01002

Sherman Lewis
State Conservationist
USDA, Soil Conservation Service
451 West Street
Amherst, MA 01002

January 16, 1981

Subject: Washington Mountain Brook
Watershed - Draft
Environmental Impact Statement

Dear Mr. Lewis:

In response to your request for comments, please find the following:

1. The project costs for the selected alternative are reasonable. The water supply aspect is cost effective.

2. The Town of Lee will face water supply costs for facilities at one dam plus pipeline costs.

3. The Town of Lenox will face water supply costs in pipeline connections to the Lee system.

Both Lee and Lenox are eligible for FmHA Loan/Grant funding assistance. FmHA would be willing to cooperate with project sponsers at the appropriate stages to review funding possibilities.

Sincerely,

for WILLIAM E. CURRY
State Director

Farmers Home Administration is an Equal Opportunity Lender.
Complaints of discrimination based on race, sex, religion,
national origin or marital status should be sent to:
Secretary of Agriculture, Washington, D. C. 20250
F-25

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Policy
Washington, D.C. 20230

OCT 31 1980

Mr. Sherman L. Lewis
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
451 West Street
Amherst, Massachusetts 01002

Dear Mr. Lewis:

This is in reference to your draft environmental impact statement entitled "Washington Mountain Brook Watershed, Berkshire County, Massachusetts." The enclosed comment from the National Oceanic and Atmospheric Administration's National Weather Service is forwarded for your consideration.

Thank you for giving us an opportunity to provide this comment, which we hope will be of assistance to you. We would appreciate receiving four (4) copies of the final statement.

Sincerely,

Robert T. Miki

Robert T. Miki
Deputy Assistant Secretary for
Regulatory Policy (Acting)

Enclosure Memo from Richard E. Hallgren
National Weather Service
National Oceanic and Atmospheric
Administration

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
Silver Spring, Md. 20910

Rec'd PP/EC
OCT 07 1980

OCT 3 1980

OA/W2x2:AF

TO: PP/EC - Joyce Wood

FROM: OA/W - Richard E. Hallgren

~~THRU: OA/D - Thomas Potter~~

SUBJ: DEIS 8009.11 Washington Mountain Brook Watershed, Berkshire County, Mass.

The DEIS addresses the flood problems of the community and non-structural alternatives, but does not reference flood warning systems in the solutions offered. As part of the structural solution proposed, a flood warning system of the type described in the enclosure should be considered. It would be an oversight not to include a warning system either as a non-structural alternative and/or companion item. Additional information on this type of system may be obtained by contacting the NWS Regional Office as follows:

National Weather Service
Eastern Regional Office
585 Stewart Avenue
Garden City, N. Y. 11530

Flash flood watches and warnings for this area are issued as a routine NWS service by the Forecast Office in Boston, Mass. Flood forecasts for the Housatanic River are prepared by the NWS River Forecast Center in Hartford, Conn.

Thank you for the opportunity of commenting on the EIS.

Attachment

FLASH FLOOD PROGRAM

In many communities the interval between heavy rainfall and flooding is too short for forecast preparation by the RFC. This generated the need for the present Flash Flood Program.

Three alternate methods are used to prevent loss of life and alleviate property damage in flash flood situation. These are: 1) self-help forecast procedures 2) Flash Flood Alarm Systems (FFAS), and 3) generalized flash flood watches and warnings. Selection of a method for a specific community depends on the hydrologic nature of the problem in that area. In some cases a combination of methods is used.

With the first method, a forecast procedure prepared by NWS officials is provided to a community official. He collects rainfall data and prepares the official forecasts required.

The FFAS is a specialized river gage which senses a pre-selected critical water level and sounds an alarm. The alarm portion of FFAS's is placed in some disaster oriented office, such as a police station which is always manned around the clock. Disaster officials warn endangered citizens and maintor upstream conditions to get an idea of the stage to be expected.

Areas which cannot be served by either of these methods must rely on flash flood watches and warnings. The watch means that conditions conducive to flooding are expected. Interested parties should stay informed and ready for immediate action if a warning is received or flooding is observed. The warning means that flooding is imminent or in progress and low areas should be evacuated immediately.

The success of any natural disaster warning program is dependent on community preparedness and pre-designed plans of action.

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

EDWARD J. KING
GOVERNOR

JOHN A. DEVICK
SECRETARY

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS

ON

DRAFT ENVIRONMENTAL IMPACT REPORT

PROJECT NAME: Washington Mountain Brook
Washington

EOEA NUMBER: 02476

PROJECT PROPONENT: Water Resources Commission

DATE NOTICED IN MONITOR: September 22, 1980

The Secretary of Environmental Affairs herein issues a statement that the Draft Environmental Impact Report submitted on the above-referenced project does adequately and properly comply with Massachusetts General Laws, Chapter 30, Section 62-62H inclusive, and the regulations implementing MEPA.

A Draft EIR for this project was submitted and reviewed in 1977 and was deemed inadequate by the Secretary. Another Draft EIR was submitted in 1978 and was deemed adequate with comments by Secretary Murphy. MEPA has reviewed the present document submitted as a Draft EIR under NEPA and, by agreement with the Amherst office of the USDA-SCS, we are considering this document as an additional Draft EIR.

Comments received on this document will therefore be addressed in a combined Final EIS/EIR. The absence of responses to comments received on the 1978 Draft EIR would require a determination of inadequacy as a Final EIR.

Although I find this document adequate to satisfy the requirements of MEPA with regard to a Draft EIR, the following issues should be addressed in the Final EIR.

GENERAL

The report should make very clear what are the specific elements of the Project. The initial phase of Washington Mountain Lake has been excluded consistently throughout the report and there is a reasonable argument that the No-Build Alternative could include the work already accomplished at WML. Therefore, the impacts, costs and benefits of WML as flood storage need not be considered as part of the project under review. However, certain elements of the project, such as costs for water supply for Lee, the costs of relocating the AT&T cable, and other incomplete elements must be carried through consistently in the analysis of both costs and environmental impacts.

FLOODING

The report indicates that after completion, 65% of the watershed will be controlled and that would indicate that a commensurate reduction in channel flow would result. If this is the case, it would follow that perhaps there would not be a need for the extensive channel alterations that are proposed.

An alternative stream control measure is to consider rebuilding the Newton Bridge, which has an inadequate opening causing flood flows to overtop the structure. These flood flows are then diverted down Washington Mountain Road causing extensive erosion and roadway damage. It is likely that the existing small bridge may be damaged considerably by construction vehicles working in the upstream areas and may require replacement anyway.

The existing watershed comes to peak discharge relatively quickly and certainly peaks earlier than the Housatonic Watershed. What will be the effect of delaying this peak from the WMB Watershed on the peak discharge in the Housantonic? Will the delayed discharge increase the potential for flooding in the Housatonic by adding to peak flows in this larger stream?

SEDIMENT CONTROL

The natural condition of WMB is to discharge as a torrent and to carry considerable sediment including large rocks and debris as bedload. The proposed sediment controls for the project as described in the DEIR are located in-stream, and are designed to collect only material larger than 6 inches in size. All sediment smaller than 6 inches will continue down the Brook toward the Housatonic What will be the effect of this sediment on the downstream areas?

The water pipeline will be constructed along the difficult terrain parallel to WMB and appears to have as many as 7 crossings of the Brook. To perform such construction in difficult terrain including stream crossings in an area of high energy runoff will be extremely difficult. What measures will be taken to handle this potentially dangerous situation?

WATER SUPPLY

The DEIR presents a brief discussion of groundwater and dismisses groundwater as an alternative source of water because of contamination by PCB's and hardness. In the original comments on this project by Secretary Murphy, a discussion of groundwater as an alternative water source was mandated and I feel that dismissal of this alternative for the stated reasons is unwarranted. There is evidence presented in the MAS comments of 10/22/80 that serious PCB contamination does not exist and that hardness may actually be a benefit in terms of public health. The FEIR shall discuss the groundwater alternative in detail.

The demand figures presented in the report based on population projections and the industrial demand figures are unsubstantiated. Since water supply is a major element in the justification of the project, the demand for water, both present and future, should be adequately documented.

The cooperative arrangement between Lee and Lenox with respect to water supply should be defined and reported in the FEIR.

Since both recreation and water supply are justifications of the project, there should be included in the FIER a detailed discussion of the potential conflicts between these two uses of the same watersheds. This is particularly true since the land is presently recreation oriented and will hopefully remain in that use.

LAND USE

The FEIR should discuss and present any agreements relating to Article 97 of the State Constitution as presented in the comment by the Division of Forests and Parks.

OTHER COMMENTS

The Division of Water Pollution Control has indicated in their comment that the conclusion regarding water quality may be optimistic. If quality problems warrant treatment, the costs of the treatment should be included in the discussion of costs.

It is clear from the comments received that there are significant questions regarding the Cost/Benefit Analysis for the project. Although MEPA has no direct jurisdiction over economic issues we have a considerable interest in this matter. Because the NEPA process requires study of the Cost/Benefit issue, we leave the response to the comments by CLF to the NEPA jurisdiction, but will review the response with interest.

SGM:RNF:jc

November 5, 1980
DATE

JOHN A. BEWICK, SECRETARY

October 22, 1980

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MASS. WATER RESOURCES COMM.
DIV. OF WATER RESOURCES

Secretary
Executive Office of Environmental
Affairs
20th Floor
100 Cambridge Street
Boston, Massachusetts 02202

ATTENTION: MEPA Unit EOEA No. 02476
Washington Mountain Brook Watershed Project

Dear Secretary:

The Massachusetts Environmental Policy Act (MEPA), M.G.L. Chapter 30,ss.61 et. seq., mandates that "[u]nless a clear contrary intent is manifested, all statutes shall be interpreted and administered so as to minimize and prevent damage to the environment." Section 61, (emphasis supplied). "(This) substantive section requires that each agency (including state boards, departments, commissions and authorities, and many local authorities) review the impact on the environment of their activities, and use all practicable means and measures to minimize or prevent damage to the environment." Environmental Policy Act" (MCLE-NELI, Inc. 1980), p. 219.

The MEPA mandate and substantive requirements are applicable to projects developed, sponsored, and funded by the state Water Resources Commission, such as the Washington Mountain Brook Watershed project. There is no evidence in the Final Environmental Impact Report (EIR)/Draft Environmental Impact Statement (EIS) that the Commission has interpreted or administered its legislative authorization in a manner which minimizes and prevents damage to the environment.

The Final EIR fails to respond to most of the issues raised in CLF's previous correspondence with MEPA and fails to respond to the statement made by the Secretary of Environmental Affairs dated April 7, 1977. CLF reasserts all issues raised in our previous correspondence and incorporates and asserts the issues presented by the Secretary in the statement dated Apirl 7, 1977.

For instance, Washington Mountain Lake is still missing from the EIR, except for the pipeline cost and the attribution of benefits. We have repeatedly stated that the costs and benefits for this PL-566 project cannot be segmented, one impoundment from the other. The multi-dam Washington Mountain Brook project is a single project in which the final EIR/EIS must include all costs of construction and engineering regardless of whether or not the construction precedes the EIR/EIS. This must be reflected in the cost/benefit ratio. In addition, the EIR/EIS must examine the environmental impact of the proposed (now completed) Washington Mountain Lake dam. I have attached as part of this comment a brief excerpt from a legal memorandum prepared as part of the background research for this project. I would particularly draw attention to the case involving a segmented SCS dam project, Concerned Residents of Buck Hill Falls v. Grant, 388 F.Supp 394 (M.D.Pa. 1975); Rev'd, 537 F.2d 20 (3rd Cir. 1976).

Another example would be the issues raised in CLF's letter dated September 6, 1978, where we question why groundwater sources are dismissed because of hardness of water and PCBs. There is no response in the present EIR/FIS to these comments or a response to Dr. Ian Nisbet's data which was presented to MEPA. Furthermore, the report appears to indicated that in recent testing in an unspecified portion of the Woods Pond aquifer, no PCBs were found (see page 86). What is the significance of this statement: More importantly, what is the response to Dr. Nisbet who has tested all sources of water, and found PCBs even in snowfall. What is the significance of this data to existing and proposed reservoirs? This raises the issue of whether the same parameters for water quality have been run on all sources considered for water supply. Is there consistency in the testing? This document is required to be a disclosure device and a planning mechanism - is it possible to make a rational decision on local or regional water supply based on the data contained within this report?

Schoolhouse Lake is now considered part of the Water supply element and has had an average annual benefit amounting to $44,090 attributed to the proposed impoundment (see Appendix A). The EIR/EIS does not discuss how Schoolhouse Lake will answer a water supply need. There is no data in the report as to how this new source of water supply is related to a supply system or how and when it is to be utilized in a supply.

There is consistently unequal treatment in the discussion of existing sources and proposed sources. There is unequal treatment of surface water vs. groundwater supplies. There is not sufficient data in the EIR/EIS upon which any agency or political subdivision could make a rational decision on regional or local water supply. The document is inadequate in its treatment of the water supply purpose of the project.

The EIR/EIS does not incorporate Lenox as part of the water supply component. The immediate critical need in the region appears from recent newspaper accounts to be a water supply problem in Lenox. The only mention of how this project would benefit Lenox appears on page 93 and concerns only an indirect benefit in that Lee will continue to supply New Lenox.

As stated earlier, we reassert our earlier comments and incorporate the Secretary's comments of 1977. The only comment of the Secretary's that we would expand upon is to question why there is no response to the Secretary's comment on page 5 of the statement which reads: ". . . . the DEIR takes a countywide view in evaluating the significance of wetland acreage lost, the recreation aspect is considered on a restricted watershed basis". It is imperative that the EIR/EIS address recreation alternatives that are not minor variations on the theme proposed by the preferred alternative. What about Buckley-Dunton Reservoir and other recreational opportunities within the county or whatever consistent geographical unit is used?

Attached are further comments on flood and sediment control and cost/benefit analysis.

Sincerely,

Judith Pickett

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October 27, 1980

Sherman L. Lewis
State Conservationist
Soil Conservation Service
451 West Street
Amherst, MA 01002

Dear Mr. Lewis:

These comments review the Draft Environmental Impact Statement (which we understand will also serve as the Final Environmental Impact Report) on Washington Mountain Brook Watershed.

This project proposes, in its entirety, three impoundments for municipal water supply, recreation, flood prevention and watershed protection. In total, it will impact approximately 3,000 acres of October Mountain State Forest.

Background

The Massachusetts Audubon Society became involved in the Washington Mountain Brook project in 1977 when we agreed to be coplaintiffs in a suit to be filed by the Conservation Law Foundation arguing that the Soil Conservation Service had failed to comply with numerous state and Federal laws and regulation required for projects of this type. In particular, the Soil Conservation Service had determined that no substantial environmental damage would occur; that therefore, preparation of a state Environmental Impact Report (EIR) under MEPA or a federal Environmental Impact Statement (EIS) under NEPA would not be required. When the Service subsequently suspended its activity on this project, pending the preparation of a Federal EIS, CLF and MAS concluded that any further proceedings in a judicial forum were inappropriate and withdrew notification of a suit at that time.

Water Supply

Secretary Murphy's Requirements; The project proposes water supply benefits fo Lee and Lenox in the form of 614 acre feet of capacity in October Mountain Lake and 620 acre feet in Schoolhouse Lake.

In Secretary Murphy's memo of February 11, 1977, in which she stated that the Draft EIR did not adequately and properly comply with MEPA and with regulations governing the preparation of EIR's, she made the following requirements for compliance:

1. adequate information about demand and supply and safe yield of the Lee water system

2. consideration of alternative solutions, including the development of abundant ground water

3. inclusion of the cost of a pipeline to deliver the water

4. a discussion of a joint Lee/Lenox water system

5. discussion of the conflict between water supply and recreation on the impoundments

1. Demand and safe yield: The demand figures proposed for Lee and Lenox , based on current population figures and projections into the future, are inadequate and incomplete and appear totally hypothetical. The Berkshire County Regional Planning Commission projections for Lee are at variance with those of the former Office of State Planning, which projected virtually no growth. There is no information on the basis for the estimates of industrialization. The same applies to Lenox. The population figures are old and there is no discussion of the way they were obtained or the projections which were used.

2. Development of ground water: There is an extremely superficial discussion of the ground water alternative (pp 84-86) and it is not included, as specifically required by the Secretary, in the discussion of alternatives. Ground water is dismissed because of hardness and possible PCB contamination.

The EIS states that recent testing of wells in the Woods Pond aquifer has indicated the presence of PCBs. It also notes that results of water tests in March, 1979, did not disclose the presence of PCBs. Dr. I.C.T. Nisbet of our Scientific Staff did extensive testing of Lenox water sources in April, 1978 and his tests revealed no PCBs in the Woods Pond aquifer. In fact, he found that surface water was more highly contaminated. His report is attached to this comment.

Hardness has been discussed at length and is not an insoluable problem. Ir is certainly not a health issue. In fact, there are recent studies which correlate hardness with freedom from disease in certain populations.

The dismissal of the ground water option because of PCB contamination and hardness is unwarranted. In our opinion, the Secretary's mandate requires this discussion ot a ground water supply as one of the alternatives.

3. Cost of the pipeline: While the cost of the pipeline itself is included in this EIS, there is no indication of how much improvements to Washington Mountain Brook Road will cost in order to make the area accessible for the heavy aquipment which will be required to install the pipeline.

4. Lee/Lenox system: There is no discussion of a LeeLenox water system. The only mention of cooperation between the two municipalities is the proposal for the sale of Lee water to Lenox.

5. Conflicts between water supply and recreation: There is minimal discussion of the conflict between water supply and recreation. More importantly, there is no discussion at all of the fact that this is a diversion of land under Article 97 of the Massachusetts Constitution, which will require a 2/3 vote of the legislature and mitigating measures to replace for the people of the Commonwealth the lands forgone to provide benefits for a small segment of the population.

Water supply conservation

There is again, a very superficial discussion of the possibility of conserving significant quantities of water through a conservation program. in the town of Lee. Lee now has flat rate for its pricing structure but there is no indication in the EIS that all of Lee is metered. Lenox, according to the EIS, has 90% metering and practices conservation, but there is no indication of whether the percentage of the consumers who are metered includes the highest consumers.

Destruction of Wetlands

There is no adequate discussion of the environmental effects on wildlife of the destruction of 65 acres of wetlands, 5,400 feet of natural perennial stream and 1500 feet of natural intermittent stream.

Wetlands are under constant pressure in Massachusetts and continue to be destroyed despite the Massachusetts Wetlands Protection Act. These serve for flood control, drinking water recharge areas, pollution abatement, wildlife habitat and fishery enhancement, among other values. The costs of these losses, or any valid acknowledgement of them, are not included in the EIS.

Costs

While I cannot include in these comments a detailed discussion of costs, there are several glaring omissions on the cost side of the ledger which I would point out:

the cost of the road improvements connected with the pipeline are omitted

the cost for Washington Mountain Lake, already built as part of the project, is omitted because the impoundment has already been constructed; I believe such segmentation is illegal.

no cost for land acquisition required to replace the land diverted in the state forest has been included

no cost for the treatment plant which may be required has been included; stringent standards being implemented under the Safe Drinking Water Act may well require treatment for turbidity, color or other contaminants

no cost for the pipeline from the treatment plant to the present system has been included

(the latter two are mentioned as part of Phase 2 but are not included in the cost/benefit ratio)

In our opinion, this EIS suffers from many of the deficiencies of previous drafts, does not address the Secretary's requirements for compliance, in many cases, and, in particular, omits the consideration of ground water for spurious reasons.

We urge you to reject it as inadequate.

Sincerely,

Deborah V. Howard

Deborah V. Howard, Co-Director
Public Affairs

Enclosure

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November 12, 1980

Mr. Sherman L. Lewis
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
451 West Street
Amherst, MA 01002

Dear Mr. Lewis:

We have reviewed the June, 1980 Draft Environmental Impact Statement for the Washington Mountain Brook Watershed in Berkshire County, Massachusetts. This document describes the remaining elements of a project consisting of conservation land treatment, three multi-purpose reservoirs, and channel work to benefit Washington, Lee, and Becket, Massachusetts. The Draft EIS indicates that the project will decrease the area subject to the one-percent chance flood and reduce associated damages to existing property by 88 percent. The multi-purpose reservoirs will also provide water supply and recreation benefits to this locality.

NERBC adopted a policy in 1978 which states that "preference is to be placed on the use of nonstructural measures to modify susceptibility to flooding" (page 16, Regional Policy Statement on Flood Plain Management in New England). This agency has not adopted specific recommendations for Berkshire County. Therefore, we have used the regional policy statement as the principle reference to evaluate the proposed project for consistency. The NERBC policy statement recognizes that the sole use of nonstructural measures may not be possible in every instance. The relationship of Washington Mountain Brook to the alluvial fan in Lee where damages are highest suggests that this may be the situation in this case.

The information presented in the Draft EIS, however, is insufficient to determine the degree to which a different combination of measures might have reduced the extent of property damage. The report does not present information on the degree to which each of the structural measures reduces the area subject to flooding for the one-percent chance event.

The section on ALTERNATIVES, page 103 through 114, shows that nonstructural measures were considered as components only in Alternative V. Presentation of the increments of protection afforded by each component measure relative to the area impacted by the one-percent flood in each alternative in the Final EIS will improve this agency's ability to make a determination on the degree to which this project is consistent with adopted NERBC policy.

We also note that on page C-1, Appendix C, the discount rate used to calculate average annual costs for the project was 3-1/4 percent. It is our understanding that the rate required by the U.S. Water Resources Council for federal projects for FY 1981 is 7-3/8 percent.

Sincerely,

Robert D. Brown
Director of Plan Utilization

RDB/RK/jh

cc. Coy Garrett, NERBC Member, Soil Conservation Service
Richard A. Gallo, NERBC Alternate, Soil Conservation Service
John Bewick, Massachusetts Secretary of Environmental Affairs
Elizabeth Kline, Assistant to the Secretary, MA EOEA

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